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MALARIA.

Cross (Bruce). **Some Theoretical and Experimental Observations on Malarial Prevention on Estates.**—*Malayan Med. Jl.* 1933. Dec. Vol. 8. No. 4. pp. 261–274. [15 refs.]

The general situation in the Malay States has not been improved by protracted anti-larval measures, though there have been many isolated successes. It is questionable whether the expense of oiling gives an adequate return. Rubber estates with oiling are compared with those without oiling. An experiment with manure instead of oil is described.

In this interesting paper, which was read at a B.M.A. meeting in Penang, the author states that though it is possible to free a given community from malaria by oiling and other antilarval measures if skilled supervision and sufficient money are available, yet there is as much malaria in the world as there was a generation ago. The main methods adopted on the rubber estates of Malaya have been open drainage and oiling. The medical officer who can only visit an estate periodically must leave the actual work of oiling to the estate manager. The anti-larval measures have been highly successful on some estates, but on others they have been a failure, and it appears that as regards mortality from malaria the agricultural population as a whole is in almost as bad a position as it was a quarter of a century ago, in spite of all the work that has been done. The author is in medical charge of a number of European-owned and Chinese-owned rubber estates; in the latter, "measures for the prevention of disease play a very insignificant part." He gives tables comparing the spleen rates, parasite rates, etc., on several European estates, where oiling is in force, with those on several Chinese estates where there is no oiling. These tables show that there is rather less malaria on the estates which are not oiled, and the author suggests that this may be due to the intensive cultivation and manuring of the ravines on the Chinese estates by market gardeners. On this assumption, he conceived the idea of polluting mosquito breeding-places with manure instead of oiling them. "About half a cart load of manure was put in an empty 64 gallon oil drum and filled up with water." It was then strained and used in the sprayers. The substitution of manure for oil did not result in disaster but in a diminution of malaria. During the year of the experiment there was less malaria throughout the country, and the author claims no more than that "there may be some considerable element of truth in the hypothesis on which the experiment was based." *W. Fletcher.*

Malacca Agricultural Medical Board. **Report, Statement of Accounts and Senior Medical Officer's Report for 1933** [Hoops (A. L.), Senior Medical Officer].—28 pp. Malacca: Wah Seong Press.

Malaria has decreased steadily for the last 4 years. Antilarval measures were surface drainage and oiling. Treatment was by atebrin and plasmoquine. Cultivation was possibly the principal cause of improvement.

The cultivated area of estates served by the Board comprises 150,782 acres; rather more than half of this area consists of European estates. There are about 20,000 labourers. The senior Medical Officer, Dr. A. L. Hoops, found at a recent survey that, out of 11,000 southern Indians working on these estates, only 10 per cent. were poorly nourished, as compared with 60 per cent. in Indian villages. He writes "anyone who like myself, has visited Madras villages cannot but draw a comparison favourable to our Malacca estates." The prevalence and severity of malaria have been diminishing for the last 4 years, and the year 1933 was the healthiest on record. The chief lines of mechanical defence have been surface drainage and oiling. The former prevents water-logging and collects the water in defined channels where it can be easily oiled if necessary. "When all is said and done, *cultivation* is possibly the principal factor in the decrease of malaria. Many estates which were, when newly opened, intensely malarious, have in process of time become so healthy that antimalarial measures are hardly needed." Atebrin, reinforced in subtertian by plasmoquine, has been the standard treatment for malaria. Short courses of quinine, lasting 7 to 10 days, are not to be compared with a 5 day course of atebrin; long courses of quinine are more expensive and yet the relapse rate is higher. About 5 per cent. of the patients treated with atebrin suffered from pain in the epigastrium at the end of treatment which was relieved by a purge In 4 patients who were taking plasmoquine together with atebrin, there was severe colic which lasted for 4 days.

W. F.

Milne (J. C.). **Malaria in Taiping.**—*Malayan Med. Jl.* 1933. Dec. Vol. 8. No. 4. pp. 290–294. With 6 figs.

The author records a small outbreak of malaria in a town which has been well provided with permanent concrete antimalarial drains. The outbreak was preceded by an unusually long period of dry weather during which the drains were not flushed out, and *A. maculatus* was found breeding just within the mouths of several large circular cement culverts, where a little water had collected owing to partial blockage by weeds, or to unevenness of the surface. The inspection chamber of the drain which had an iron grating over it, was another unusual place in which larvae were found. *W. F.*

Gater (B. A. R.). **Notes on Malayan Mosquitoes, V. Some Remarks on *Anopheles maculatus* Theobald in Relation to Malaria.**—*Malayan Med. Jl.* 1933. Dec. Vol. 8. No. 4. pp. 277–283. With 2 figs. [13 refs.]

Are there different races with different food preferences within the species *A. maculatus*? Is the December rise of malaria due to the efflorescence of latent infection?

(1) Racial differences in the same species of mosquito have been shown to be of importance in the transmission of malaria, notably in the case of *A. maculipennis*. CHRISTOPHERS considers that the heavily scaled *A. willmori* of the Himalayas is really a variety of *A. maculatus*. *A. maculatus* var. *dravidicus*, which occurs in the peninsula of India, is more heavily scaled than typical *maculatus*, but less heavily than *willmori*. This form, too, CHRISTOPHERS considers inseparable from typical *maculatus*, but he has noted that it differs from the typical form in not being a haunter of houses or cattle-sheds. This suggested to the author that there might be some relation between the heaviness of the scaling on the abdomen and the susceptibility to infection. Numbers of *A. maculatus* were fed on patients suffering from subtertian malaria. Out of 128 examined, 67 became infected, but the susceptibility to infection did not appear to have any relation to the abdominal scaling.

(2) WATSON's " maculatus wave " in the Malay States occurs between February and July, and is followed by a rise in malaria. A second increase of malaria occurs in December which it is difficult to correlate with the incidence of *A. maculatus*. Colonel S. P. JAMES suggested to the author that this December rise might be similar to the spring malaria of Holland which is due to latent infections acquired months before. *W. F.*

IYENGAR (M. O. T.). **Anophelines found Naturally Infected with Malaria Parasites in Travancore.**—*Records of the Malaria Survey of India.* 1934. Mar. Vol. 4. No. 1. pp. 61–63. With 8 figs. on 2 plates.

The following natural infections of anopheles were found during the routine examination of mosquitoes caught in intensely malarious villages near Kulasekharain in Travancore : *A. jeyporensis*, 3 specimens contained oöcysts out of 1,988 dissected between February 1932 and September 1933. (1) *A. varuna*, one oöcyst infection was observed out of 59 examined. (2) *A. fluviatilis*, 4 oöcyst infections and one salivary gland infection were found in 132 examined. (3) *A. culicifacies*, one specimen with salivary gland infection was found among 984 examined.

W. F.

DE MELLO (Froilano). Première campagne antimalarienne active à Gôa. [**First Active Anti-Malaria Campaign at Goa.**]—*Arquivos da Escola Méd.-Cirurg. de Nova Goa.* Ser. B. 1934. No. 5. pp. 1025–1211. [In French, with Portuguese official memoranda and reports intercalated.]

The country of Goa consists of two main divisions—Velhas Conquistas in which there is very little malaria, and Novas Conquistas in which there is a great deal. The standard of living, the civilization, means of communication and the like are far more advanced in the Velhas Conquistas, and there is an average of one doctor to every 2·85 kmq., whereas in the Novas Conquistas there is only one to 122·09 kmq. Novas Conquistas is mountainous, and much of it is covered with jungle, communication is difficult, and the people are very poor. Malaria has become a very serious problem there; during the last thirty years, it has spread to villages which were formerly free from it, and in

many districts the population has been decreasing steadily year by year. The splenic index varies from village to village; in some it is low, in others it reaches 100 per cent. The anophelines are: *culicifacies, maculatus, sinensis, listoni, fuliginosus, stephensi, leucosphryus, pulcherrimus, ludlowi, rossi, jamesi, vagus, barbirostris, culiciformis, karwari, aitkeni, theobaldi.*

A Commission was appointed by the Governor, in 1929, to inquire into the situation, and in its report drew special attention to the need for (1) improved means of communication, (2) medical assistance, (3) pure drinking water, (4) drainage and irrigation. As a result of this report, a number of medical units has been established in different parts of the country and free medical treatment has been provided for all labourers and for all others who cannot afford to pay for it. All collections of water within a kilometre of habitations are drained or treated with Paris green. Jungle and undergrowth around villages and on the banks of streams are cleared away. In the very malarious villages, the inhabitants are given a 7 days' mass treatment with quinine and plasmoquine, followed by two doses a week for 3 months. At the same time, collections of water are treated with Paris green and adult mosquitoes are killed in the houses by fumigation. The medical units do not limit their activities to malaria, but deal with all matters connected with preventive medicine, such as water-supplies and the like. The results have been most encouraging. *W. F.*

MORIN (H. G. S.). Premiers résultats de l'emploi de procédés agronomiques dans la lutte antipalustre en Indochine. Expériences de M. Dupasquier. [**Agriculture in the Prevention of Malaria in Indo-China.**]—*Bull. Soc. Méd-Chirurg. Indochine.* 1934. Feb. Vol. 12. No. 2. pp. 230–244. With 5 figs. on 2 plates, 2 text figs. & 1 chart.

The growing of shade trees over breeding places gives good results after 2 or 3 years.

M. DUPASQUIER, the director of the experimental agricultural plantations at Phu-ho, had little money for anti-malaria work at his disposal and such work was expensive because the houses and the anopheles breeding places were scattered over a wide area. He screened some of the houses and he oiled some of the breeding places, but the main method of control adopted was the planting of shade trees and plants along the ditches and streams, with a view to preventing the breeding of the sun-loving anophelines of the district.

For a long time no improvement followed, but now, after two or three years, there is a reduction in the amount of malaria. Constant supervision of the shade trees is necessary, and where disease has caused withering and let in the sunlight, it is necessary to oil. Certain leguminous plants are useful for planting in gullies after a preliminary draining by an open earth drain, and they are useful as manure. The following have been found the most suitable: *Crotalaria anagyroides, Cassia hirsuta,* and *Cassia alata.* In order to prevent breeding in ditches and canals, a row of shade trees is planted along each bank. The best results have been obtained with the common Melastoma which is plentiful in the district. The paper is illustrated with excellent photographs. *W. F.*

i. Khaw (O. K.) & Kan (H. C.). **Some Observations on the Prevalence of Malaria in Nanking and its Vicinity.**—*Chinese Med. Jl.* 1934. Feb. Vol. 48. No. 2. pp. 109–123. With 2 figs. (1 map). pp. 109–123. [28 refs.]

ii. Yang (C. S.) & Chiang (W. L.). **Some Notes on Malaria in Nanking. A Review of 250 Cases.**—*Ibid.* pp. 124–137. With 6 figs. [20 refs.]

i. Many refugees have come to Nanking; there is a good deal of malaria; the only anopheles is *A. hyrcanus*.

Discharged soldiers, indigent farmers from the north and refugees from provinces which have suffered from flood and famine have flocked to Nanking where they have sought temporary shelter on the outskirts of the city. Unskilled labour is paid at the rate of 30 cents. a day, and, if a man works every day of the year, he can earn about £10 in the 12 months. It is therefore not surprising that Nanking is unhealthy. During the spring and summer of 1932, the authors examined 6,976 persons. The total spleen rate was 18 per cent.; in children under 12, it was over 30 per cent. The total parasite rate was 13 per cent.; it was considerably higher in children than in adults. *P. vivax* constituted 65 per cent. of the infections throughout the year, and 79 per cent. in May; *P. falciparum* 27 per cent. throughout the year, and 52 per cent. in August and September; *P. malariae* 8 per cent.; this type reached its maximum in late autumn. The only anopheline found was *A. hyrcanus* var. *sinensis*.

ii. The authors have investigated malaria in 250 cases admitted to the Central Hospital during the last 3 years. The majority of their patients were young soldiers and labourers suffering from subtertian malaria. The case mortality was 13 per cent. in subtertian, and 6 per cent. for the whole group. *W. F.*

Russell (Paul F.) & Nono (Andres M.). **A Mosquito Net for Use in the Philippine Islands. Experimental Studies and Canvass of Materials.**—*Philippine Jl. Sci.* 1934. Feb. Vol. 53. No. 2. pp. 107–140. With 10 plates & 1 fig. [26 refs.]

The houses of natives in the Philippines are unsuitable for protection by wire screening. "The first step in malaria prophylaxis to be undertaken by a health officer in the Philippines should be the making of necessary arrangements for the sale of suitable mosquito nets locally." The authors tried a local product known as Sinamay which is made from an indigenous banana (the source of "Manila hemp"), and they found that it impeded the passage of air less than cotton mosquito-netting which was more expensive. Where there is no mattress, or where a bed is not used, the net should have tunnels near the bottom in which bamboo poles or stones can be placed as weights to keep the net in place. If there are holes in the floor-boards under the sleeper these should be covered by a closely woven mat. *W. F.*

Earle (Walter C.). **Summary of Malaria Activities in Grenada, B.W.I., 1929–1932 Inclusive. [Report made to the Rockefeller Foundation.]**—*Grenada Rep. Med. & San. Dept. Year 1932.* pp. 44–52.

Malaria is practically confined to the narrow coastal belt of Grenada. *A. tarsimaculatus* is the carrier.

The hills of Grenada, a small island of the Windward group about 100 miles north of Trinidad, rise abruptly from the sea, so that there is no flat coastal plain on the western side and only a narrow belt on the east. Malaria is almost entirely restricted to this narrow strip; it is very uncommon at an elevation of more than 500 feet. There are about 8,000 cases of malaria and 70 deaths from the disease in a population of 80,000, most of whom are coloured. In 1929, a survey was made by Dr. F. Root of the Rockefeller Foundation, with the assistance of Dr. L. S. Morgan, of the Grenada medical department, who has been, since then, in charge of the malaria work in the island. A spleen rate of 12·3 and a parasite rate of 5·1 were found during the survey. Of the infections, 42 per cent. were *P. vivax*, 44 per cent. *P. falciparum*, 11 per cent. *P. malariae*, and 3 per cent. mixed. During the period covered by the present report, 90 per cent. of the infections were due to *P. falciparum*.

There are three species of Anopheles, *A. tarsimaculatus*, *A. argyritarsis*, and *A. pseudopunctipennis*. *A. tarsimaculatus* has been found wherever there is much malaria, and it is undoubtedly the principal, if not the only, carrier. *A. pseudopunctipennis* does not come into houses to feed on man, it is not easy to infect, and it can probably be disregarded as a carrier. *A. argyritarsis* is easily infected in the laboratory, but it shows no preference for human blood and never attains a high density. It may be a contributing cause of malaria. Numbers of *A. tarsimaculatus* were dissected; the sporozoite rate was 0·5 per cent., and the oöcyst rate was 1·1 per cent. The chief breeding places are: (1) the stagnant pools or lagoons at the mouths of rivers, where the outflow is blocked by a sandbank; (2) mangrove swamps, and wet areas near the coast; (3) old craters of volcanos which have become full of water; (4) ditches in cocoa groves, and in tall grass. *A. tarsimaculatus* can breed in brackish water and in conditions of dense shade. *A. pseudopunctipennis* is most common in water containing algae, and exposed to the sun. *A. argyritarsis* is able to breed under the most varied conditions, but its density is never very high. *A. tarsimaculatus* is the only one with a decided preference for human blood. It shows a marked tendency to rest where it feeds.

One of the areas in which malaria is most severe has been treated with Paris green for the last 2½ years, but "it is a little difficult to definitely appraise the value of the Paris green work." A sum of $15,000 has been obtained from the Colonial Development Fund for malaria control by drainage of the malarious Sauteurs area. This is mainly a question of maintaining free outlet to the sea from swampy areas, and the canalization of ravines. Lake Antoine, an old volcano crater, is responsible for malaria, and impossible to drain; it is suggested that the population might be removed from its immediate neighbourhood. *W. F.*

Schwetz (J.). Comparison entre l'infection malarienne des indigènes de la forêt équatoriale et de ceux de la savane. Influence de l'altitude. [**Malaria in the Equatorial Forest compared with Malaria in the Savannah.**]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 11. pp. 1226–1228.

Malaria in the savannah on the Eastern border of the Belgian Congo, in the neighbourhood of Lake Edward, depended upon the altitude;

below 1,400 metres it resembled that of the equatorial forests in type and intensity, but above 1,500 metres its intensity diminished and beyond 1,800 metres it disappeared. *W. F.*

Tournier (E.). Le paludisme à Lomé et au Togo en 1932 et 1933. [**Malaria at Lome and in Togoland.**]—*Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 385–396.

Malaria in Lome is subject to great variations from year to year; in dry years there is very little, because the lagoon behind the town is dried up, but when the rainfall is heavy, malaria is severe. The anopheles of Lome are: *A. costalis, A. funestus, A. pharoensis, A. mauritianus,* and *A. nili*; the last two are very rare. The parasitic index of the inhabitants varies from about 50 to 70; 96 per cent. of the infections are due to *P. falciparum,* and 4 per cent. to *P. malariae.* The parasitic index in about 58,000 persons examined in various parts of Togoland was 50 per cent., and almost all the infections were subtertian. The adult native acquires little immunity, and he reacts to infection like a European. *W. F.*

Shahin (Mohamed). Le paludisme en Egypte. [**Malaria in Egypt.**]—*Bull. Office Internat. d'Hyg. Publique* 1934. Mar. Vol. 26. No. 3. pp. 449–455.

The large amount of constructional work on roads and railways carried out during the war, and the thousands of infected soldiers led to an increase of malaria, and, in 1916, the *Commission pour la Lutte contre le Malaria* was appointed.

The Commission has an annual budget which is expended on drainage, antilarval measures, etc. Three malaria centres were set up in important places; but one of them—at Fayoum—has since been closed owing to the amelioration of conditions there. A large amount of quinine is distributed in tablet form; plasmoquine and atebrin are administered under supervision at the malaria centres. Laws have been enacted by which landowners and householders can be required to take steps to prevent mosquito breeding on their premises, and by which malaria can be made a notifiable disease in any locality. *W. F.*

El Khalidi (H. F.). **A Résumé of Pre- and Post-War Statistics of Malaria in Palestine and its Control in Urban Areas.**—*Jl. Egyptian Med. Assoc.* 1933. Aug. Vol. 16. No. 8. pp. 843–849.

Shapiro (Jos. M.). **Rural Malaria Control in Palestine.**—*Ibid.* pp. 850–857.

i. A good example of the suppression of malaria in a city.

The author is an officer of the Public Health Department. He was born and bred in Jerusalem, and, when he was a boy, he was given a daily ration of quinine at certain seasons because every one in the city had occasional attacks of malaria. He still lives in Jerusalem, but malaria has almost disappeared, and in 1932 there was not a single primary case; his children have never tasted the bitterness of quinine. In 1918, there were 113 deaths from malaria in Jerusalem; in 1931 and 1932 there were none. Formerly, *A. bifurcatus* bred in great numbers in the water cisterns, but these have been rendered mosquito-proof by means of iron covers, and pumps have been provided; other breeding places have been oiled. The result is that *A. bifurcatus* can no longer be found in Jerusalem.

ii. Drainage and Paris green are the chief means employed to control rural malaria.

There are three main mosquito periods : the first, which occurs in spring and early summer, is the result of local breeding ; the second, which occurs in the autumn, is partly due to an invasion by mosquitoes which fly to the villages from comparatively distant swamps as much as 7 kilometres away, apparently in order to seek shelter for hibernation ; the third period is in the winter, when the rural mosquitoes remain quiet, though they sometimes feed when the weather is mild and they occasionally cause malaria. The principal carrier is *A. elutus* ; other carriers are *A. sergenti*, *A. superpictus*, *A. multicolor*. and *A. pharoensis*. As regards antilarval drainage work, the size of swamps has been reduced by cutting canals ; both subsoil and open drains have been used. In places difficult to drain, pumps have been employed. The remaining breeding places are treated with larvicides from the beginning of the breeding season. Vegetation is cleared in order to make the application of larvicides easier. " The larvicide par excellence used in rural Palestine is Paris green." Oil is useful in early spring. Gambusia have multiplied freely, but have not been found " entirely reliable as larvicides." *W. F.*

HAKKI (Ismaïl). Les moustiques de Turquie. Etudes épidémiologique et prophylactique du paludisme.—*Rev. Méd. et Hyg. Trop.* 1934. Jan.–Feb. Vol. 26. No. 1. pp. 25–34.

HUSAMETTIN. **Malaria Control in Turkey.**—*Quart. Bull. Health Organisation, League of Nations.* Geneva. 1934. Mar. Vol. 3. No. 1. pp. 129–152. With 1 map.

The percentage of enlarged spleens in the autumn of 1932 was 19·5. The index in children under 10 was 25·3. The percentage with parasites in the blood was 14·4 ; in children under 10 it was 15·6. The spring epidemics are due to *P. vivax* in almost all areas ; the autumn examinations always show a higher proportion of *P. falciparum* than the spring tests—according to the locality and the season, sometimes one form of parasite predominates and sometimes the other—quartan is widely distributed, but scanty. The carriers are *A. maculatus*, *A. elutus*, and *A. superpictus*. Other anopheles found in the country are *A. bifurcatus*, *A. algeriensis*, *A. nigripes* and *A. hyrcanus*.

" One of the first aims of the Government of the Republic was therefore to create an organization which would be able to supply medicaments to even the remotest villages. Law No. 839, of May 13th, 1926, laid down the technical and administrative bases of the campaign against malaria." Under this law an antimalaria service has been created, and the country has been divided into eleven areas, each under the direction of a qualified malariologist. The eleven areas are divided into 64 sectors directed by medical officers, and into 255 sub-sectors in charge of health agents. The ministry of health distributes free quinine to the poor. Public and private undertakings, and farmers, are obliged to supply their servants with quinine. All stagnant water which may serve as a breeding place must be removed ; the local inhabitants are obliged to carry out small drainage works themselves, extensive schemes, such as the drainage of large marshes, are carried out by government. When an owner omits to drain off stagnant water likely to form a breeding ground for anopheles, the work is done by the State at the owner's expense. Where drainage is impracticable, larvivorous fish are introduced or larvicides are used. The doors and

windows of all factories, schools and public buildings are required, by law, to be screened. Subsequent to the introduction of these measures, and the distribution of quinine for curative and prophylactic purposes, there has been an improvement in the health of the people and a reduction in the size of their spleens. *W. F.*

Sautet (Jacques). Paludisme d'hiver en Corse ; ses rapports avec le peuplement anophélien homodyname. [**Winter Malaria in Corsica.**]—*Riv. di Malariologia.* 1934. Vol. 13. No. 1. pp. 97–103.

The winter is mild on the coastal plain of Corsica where malaria occurs, and the mean temperature is about 10°C. (50°F.). *A. maculipennis* goes into shelter, but not into complete hibernation, it can easily be aroused and it will feed and even lay its eggs. Its winter quarters are not inhabited houses, because these are far too smoky, but abandoned sheds, ruins and the like.

A few cases of subtertian malaria occur in Corsica during the winter. Batches of cases do not occur in the same house, but they are widely scattered and without relation to one another. The author attributes these cases to infections contracted by individuals who are bitten when they disturb the anopheles in their uninhabited shelters. The attacks occur after the usual incubation period ; there is no long period of latency as in the malaria (benign tertian) of Holland. [See also p. 465, above]. *W. F.*

Nezitch (Eugen). La malaria en Dalmatie.—*Bull. Office Internat. d'Hyg. Publique.* 1934. Mar. Vol. 26. No. 3. pp. 463–473.

Rankov (M.). La malaria dans la Serbie du Sud. [**Malaria in Dalmatia and in South Serbia.**]—*Ibid.* pp. 474–489. With 4 figs.

i. Very little money has been available for antilarval work, but considerable improvement has been effected, chiefly by quinine and, in Dalmatia, by Gambusia.

Dalmatia is the most malarious part of Jugoslavia, though the coast is comparatively healthy. The people are miserably poor and live in a very primitive condition ; in 1921, 25 per cent. of them were found to be infected with malaria. There is an Institute for the study of malaria at Trogir, with antimalaria stations in all the principal malarious districts. All three forms are present, but subtertian is the most common. There is very little malaria during the winter, though it is possible that some transmission occurs ; it begins to increase in the spring, when the people have very little to eat and are exhausted by work in the fields. This rise is due to the efflorescence of latent infections, and begins before mosquitoes have appeared ; it reaches its maximum at the end of July. There is a second rise in October which follows the autumn rains. Quartan is more common in the winter, benign tertian in the spring, and subtertian in the autumn. The anopheles are : *maculipennis, elutus, algeriensis, superpictus, sinensis* and *bifurcatus*. *A. maculipennis*, the most important carrier, is ubiquitous. Men and money for antimalaria work are very scarce, but great success has been achieved in some districts by the use of quinine, gambusia and oiling. Apart from the reduction in the number of cases there has been a change in the type, and the proportion of subtertian infections is less than before.

ii. Southern Serbia consists of mountainous districts and wide valleys. *A. superpictus*, which breeds in running water, is the vector

in the mountainous parts, and *A. maculipennis* is the vector in the plains. As in Dalmatia, there is a spring rise of malaria, chiefly due to relapses and latent infections, which is benign tertian in type; fresh infections appear in June, both benign and subtertian, and the curve reaches its peak in August. There are not many quartan cases, they are most common in October. In children under 5 years of age about 55 per cent. of the infections are due to *P. falciparum* and 45 per cent. to *P. vivax*, but above 5 years the proportion of *P. vivax* infections falls rapidly, and between the ages of 5 and 10 it is only 20 per cent. When anti-malaria work was begun in 1921, there was neither a laboratory nor a trained staff; the colonists in the areas devastated by the war were decimated by malaria, trains were held up because the drivers were too ill to drive them. Since then, the state public health service has undertaken a campaign against malaria, under the direction of the Institute of Hygiene at Skoplje, with 50 sub-centres. Though means are limited, the attempt has been successful; at Skoplje, for example, malaria has been reduced in 5 years by 41 per cent. Quinine has been the main weapon; its advantages are that it gives immediate results and does not call for so large a capital outlay as permanent antilarval measures. Another important step has been the provision of free meals for poor children. Antilarval works have been carried out so far as funds permitted. *W. F.*

Escalar (G.). L'esperimento di Ardea. [**Zooprophylaxis in Ardea.**] —*Riv. di Malariologia.* 1934. Vol. 13. No. 2. pp. 217–227. English summary.

The earlier results of this experiment in zooprophylaxis (a belt of pigsties round the village) were given in a former paper (this *Bulletin*, Vol. 30, p. 866). In the first months of 1933, seven pigsties were added to the existing 20 in order to complete the protective belt. The results were even better than before; from August to December no case of malaria was observed and the Governor of Rome removed the village nurse because she was no longer necessary. In the surrounding unprotected villages, many cases of malaria occurred. *W. F.*

Lutrario (A.). La prophylaxie du paludisme par la quinine. [**Quinine Prophylaxis.**]—*Bull. Office Internat. d'Hyg. Publique.* 1934. Mar. Vol. 26. No. 3. pp. 456–462.

Powdered bark was imported into Rome in 1642 (some years after the cure of the Countess of Chinchon by the Jesuit, Father Bartholmee Tafur) and Cardinal De Lugo, also a Jesuit, superintended its distribution. The natives of Peru called it Kin-Kin, and in a letter written by Brother Paolo Puccerini, pharmacist of the Collegio Romano, dated 1659, it is referred to as China-China. In 1748 Linnaeus named it Cinchona in honour of the Countess. The reliance which Italy places on this sovereign remedy, both for treatment and prophylaxis, is manifested in her quinine laws. As a prophylactic it is given daily in doses of 0·4 to 0·6 grams, or in doses of 1 gram on two consecutive days every week. Before the quinine laws came into force, the deaths from malaria amounted to more than 20,000 a year; in 1888, 546 per million of the inhabitants died from it. With the quinine laws, there was a progressive diminution down to 2,045 deaths in a year, or 57 per million. The shortage of both quinine and labour during the war caused a serious set-back, but this has now been remedied. The benefits of prophylaxis

were even more striking where better supervision could be exercised, as in the case of troops, railway servants and the like. The Italian school does not subscribe to the view held in many countries, to the effect that prophylactic quinine does no more than render the disease latent ; on the contrary, it teaches that the drug frequently destroys the infection by assisting the defensive mechanism of the body in developing an immunity. *W. F.*

Ciuca (M.), Ballif (L.) & Chelarescu-Vieru (M.). Contrôle de l'immunité paludéenne acquise à la suite d'inoculations répétées de sang virulent. Essais d'infection provoquée par piqûres d'anophèles infectés expérimentalement. [**Immunity due to Repeated Inoculation of Virulent Blood.**]—*Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 330–333.

Mosquitoes infected with benign tertian malaria gave positive results in 70 per cent. of cases, when employed for the therapeutic inoculation of paralytic patients at Socola (Rumania). The injection of virulent blood gave positive results in only 50 per cent. No difference in virulence was found between a strain of benign tertian which had undergone 102 direct passages by blood inoculation from man to man, before mosquitoes were infected with it, and a second strain which had never been passed direct. Patients who had been rendered immune to benign or subtertian malaria by the repeated inoculation of virulent blood were also immune to the same strain if it was inoculated by mosquito bites. *W. F.*

Ciuca (M.), Ballif (L.) & Chelarescu-Vieru (M.). **Immunity in Malaria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. May 9. Vol. 27. No. 6. pp. 619–622.

At Socola, Rumania, 1,198 patients were inoculated with a routine benign tertian strain ; only 50 per cent. showed fever ; 16 per cent. became temporary carriers, and 34 per cent. were immune. The immunity was increased by further inoculations ; after 3 of them, it rose to 86·7 per cent. After 4 inoculations, it rose to 100 per cent. and withstood the transfusion of 200 cc. of virulent blood and the bites of 25 mosquitoes infected with the same strain. In quartan malaria, the process of immunization was slower ; 35 per cent. resisted the first inoculation and 81 per cent. resisted the sixth. In subtertian, immunization took place still more slowly ; 39 per cent. were immune to the first inoculation ; 75 per cent. immune to the fourth, and 97 per cent. immune to the fifth. A latent infection after only one inoculation does not generally guarantee immunity. Acquired immunity in malaria is sometimes due to latent infection (premunition), but in some cases of immunity the authors were unable to find any evidence of this. *W. F.*

Jonchère. Quelques conceptions actuelles sur l'épidémiologie et le traitement du paludisme. [**The Epidemiology and Treatment of Malaria.**]—*Ann. de Méd. et de Pharm. Colon.* 1934. Jan.–Feb.–Mar. Vol. 32. No. 1. pp. 46–69.

The author attended the course of instruction at the School of Malariology connected with the Paris Faculty of Medicine, and took part in the tour of instruction organized by the League of Nations in Yugoslavia. This paper is an account of what he saw and heard.

The principal antimalarial measures adopted in Macedonia are : free treatment for the sick ; inspection of schools and treatment of

infected children ; distribution of Gambusia ; dusting with Paris green of such breeding places as cannot be destroyed. These measures are in force from the middle of April until the end of October every year and have effected a great improvement. *A. maculipennis* breeds in the valleys and is responsible for the propagation of *P. vivax* in the early part of the season ; *A. superpictus* breeds in the mountain streams and is responsible for the autumn outbreaks of *P. falciparum* infection.

The author discusses CELLI's three types of malaria in Europe : (*a*) the North European type with a characteristic outbreak of benign tertian in the spring, which KORTEWEG has shown to be due to infections acquired in the previous autumn, the transmitter being *A. maculipennis*, var. *atroparvus* ; (*b*) the North Italian type, in which benign tertian reaches its maximum in August and September, while subtertian and a few quartan cases occur in the autumn. The carrier is *A. maculipennis* var. *elutus* ; (*c*) the South Italian type. Here, benign tertian increases from January to March, chiefly from recurrences : there is a second and greater increase in June and July due to fresh infections. Subtertian is the predominant form in this zone, it reaches its maximum in July and August, declines slowly in the autumn, and then almost disappears in winter and spring. The carriers are *A. maculipennis* vars. *labranchiae* and *elutus*.

A useful table of the different varieties of *A. maculipennis* is given, following MISSIROLI and HACKETT :—(1) var. *messeae*. An inoffensive race which prefers the blood of animals and ceases both egg-laying and feeding in the winter. Common in the north of Italy, and breeds in quiet fresh water. The eggs have long floats, and are either entirely grey or irregularly pigmented. The larvae have branched hairs on the second abdominal segment. (2) var. *maculipennis*. This is also a relatively inoffensive race. It is most widely distributed, and, like *messeae*, breeds in sweet water. The eggs have long floats with two dark transverse bands on a grey ground. The larval hair is palmate. (3) var. *atroparvus*. This variety is responsible for benign tertian malaria in the north of Europe. It breeds in brackish water, especially in the polders of Holland and in the peaty waters of bonified areas in north Italy. Though it ceases to lay eggs in the winter, it does not cease to feed. The eggs of this race have short floats and are coloured brown, with darker patches. The larval hair is palmate. The numbers of this mosquito can be reduced by comparatively slight modification of their breeding places. (4) var. *labranchiae*. This variety breeds in salt water on the shores of central and southern Italy, and in Sicily and Sardinia, but it can adapt itself to the fresh water of rivers. It lives in close association with man, and is one of the chief vectors of malaria in southern Europe. The egg floats are short, and the eggs themselves are dapple grey. The larval hair is palmate. (5) var. *elutus*. This variety and the last are the principal vectors of malaria in south Europe. In Italy and the rest of Europe, it breeds in brackish water ; in Palestine it breeds in fresh water. The eggs of *elutus* are uniformly grey. Floats are absent or rudimentary. (See also this *Bulletin*, Vol. 30, pp. 825, 832.) *W. F.*

BOYD (Mark F.) & STRATMAN-THOMAS (Warren K.). **Studies on Benign Tertian Malaria. 5. On the Susceptibility of Caucasians.**—*Amer. Jl. Hyg.* 1934. Mar. Vol. 19. No. 2. pp. 541–544.

The authors have shown that many negroes are refractory to inoculation (*ante*, p. 419) but they have found that " adult individuals of the

Caucasian race are quite uniformly susceptible. Failure to become infected after exposure is due to deficiencies in the parasite or to premunition." They exposed 103 white patients to mosquito infection ; 16 failed to become infected. Twelve of the 16 were exposed a second time, with the result that they were all successfully infected. *W. F.*

Helpern (Milton). **Malaria among Drug Addicts in New York City. An Epidemic of Aestivo-Autumnal and Quartan Malaria among Drug Addicts in New York City transmitted by the Use of Contaminated Hypodermic Syringes.**—*Public Health Rep.* 1934. Mar. 30. Vol. 49. No. 13. pp. 421–423.

Main-line shooters and malaria.

Eighteen deaths from malaria—17 subtertian and 1 quartan—occurred among drug addicts in New York, during 4 months at the end of 1933. The men were all in the habit of injecting heroin intravenously—so-called " main-line shooters." A few had been in the tropics, but most of them had never left New York. An investigation carried out with the assistance of detectives belonging to the narcotic squad and the homicide squad of the police department revealed that almost all the deceased addicts had frequented the same lodging houses, where the " spike," or hypodermic syringe, was shared by several men at a sitting. A subsequent examination of 150 addicts in a New York prison showed that 9 had parasites in their blood. More infected addicts were found in other parts of the City ; among them were 5 quartan cases, an unusual infection in this part of the world. (See Faget, above, p. 164.) *W. F.*

Wayl (P.). Paludisme congénital. [**Congenital Malaria.**]—*Jl. Egyptian Med. Assoc.* 1934. Jan. Vol. 17. No. 1. pp. 10–15. English summary.

The new-born child of a woman with chronic malaria and an enormous spleen became restless on the 3rd day, on the 4th day it had fever and, on the 6th, subtertian rings were found in its blood. In a second case, where the mother had suffered from malaria in infancy, the baby had fever on the 3rd day and subtertian parasites were found in its blood. *W. F.*

Martin (René), Chassigneux & Rouëssé. Un cas de paludisme autochtone au voisinage de Maison-Blanche. [**Malaria contracted near a Paris Asylum.**]—*Bull. Acad. Méd.* 1934. May 15. 98th Year. 3rd. Ser. Vol. 111. No. 18. pp. 647–649.

Malaria contracted in the neighbourhood of a hospital where malaria therapy was employed.

A young woman who frequently went for evening walks with her husband in the vicinity of the asylum of Maison-Blanche, at Gagny (Seine-et-Oise), became infected with benign tertian malaria. Her husband had a similar attack, but he was not admitted to hospital, and his blood was not examined. The young woman had never left France, and for several years she had not been outside the valley of Paris. The author had no doubt that she and her husband had been infected from cases of therapeutic malaria under treatment in the asylum. The Académie decided to send to the Committee of the malaria-therapy

centres a resolution proposed by Professor MARCHOUX to the effect that the inoculation and treatment of therapeutic malaria should be entrusted to specialists in malariology, and should be carried out only in urban institutions. (See this *Bulletin*, Vol. 30, pp. 826–7.)

W. F.

GREIG (E. D. W.). **Case of Post-Malarial Anaemia with Marked Reticulocytosis.**—*Jl. Trop. Med. & Hyg.* 1934. May 15. Vol. 37. No. 10. pp. 150–152.

The patient, aged 56, had lived in tropical Africa for 36 years. At the beginning of treatment, the red cell count was 1,560,000 ; haemoglobin 36 per cent. ; reticulocytes 35·9 per cent. ; normoblasts 0·8 per cent. ; white cells 15,000. The temperature was 100·4°F. but no parasites were found. He was given two courses of quinoplasmoquine and kept in bed for a month. He was also treated with liver extract, Blaud's pills and arsenic. The reticulocytes rose to 60 per cent. with the quinoplasmoquine treatment, but declined when iron and arsenic were given. At the end of 4 months, the red cells had risen to 4,000,000 and the haemogoblin to 60 per cent. ; the reticulocytes had fallen to 15 per cent. *W. F.*

MICKANIEWSKI & HAI. La forme purpurique du paludisme pernicieux. Son traitement. [**Purpuric Malaria.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1934. Jan. Vol. 12. No. 1. pp. 66–78.

The authors have seen five cases of purpura in Indochina in three young men, a woman, and a girl of fifteen. All the patients were suffering from chronic subtertian malaria of several years standing. They were all anaemic, with blood counts between two and three millions, and they all had enlarged spleens. They were treated with injections of saline, hypertonic serum, antivenine, plasmoquine, etc., and they all recovered. None of them had taken quinine, and the authors state that it should not be employed in these cases. The symptoms were very much the same in each of the five patients. The first case was seen in 1926 ; the attack began with the appearance of petechiae and ecchymoses which were followed, in a couple of days, by haemorrhage from the nose, bladder and rectum. *W. F.*

EMILE-WEIL (P.). Trois cas de splénomégalies en apparence primitives chez des paludéens latents. [**Three Cases of Apparently Primary Enlargement of the Spleen in Latent Malaria.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1934. Apr. 23. 50th Year. 3rd Ser. No. 12. pp. 539–546.

Three patients, apparently suffering from primary enlargement of the spleen, had their spleens removed and, in each case, the operation was followed by an attack of malaria with parasites in the blood.

The first patient came from Corsica ; he gave no history of malaria and no parasites could be found in his blood ; but, 12 days after his spleen was removed, he had an attack and parasites were demonstrated.

The second patient was an Algerian who had lived in France for 13 years. Here also there were neither parasites nor history of malaria, but splenectomy was followed by an attack.

The third patient was a Greek who was born in Smyrna, but had lived in France for 16 years. Here, again, there were neither parasites nor history of malaria, but, about a month after his spleen had been removed, he had a typical attack with parasites in the blood. *W. F.*

Natali (Claudio). Histologische Untersuchungen ueber Nebennierenveränderungen bei einem Fall von Malaria tropica und vergleichende Untersuchungen an Nebennieren experimentell infizierter Affen (*Plasmodium knowlesi*). [**Histological Study of Changes in Suprarenals in Case of Malignant Tertian Malaria and in Monkeys experimentally infected with** *P. knowlesi*.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. June. Vol. 38. No. 6. pp. 243–249. With 2 figs. [18 refs.]

A histological study of the suprarenals of an English sailor who contracted malignant tertian malaria in West Africa and died in Hamburg, and of 9 monkeys experimentally infected with *P. knowlesi*.

From his histological investigations the author reaches the following conclusions :—That in acute malaria constant alterations of a definite anatomical type are found in the suprarenals which account for the severe symptoms, and the rapid and fatal course. The changes have no relation to the number of parasites. They are a haemorrhagic necrotic inflammation involving both medulla and cortex, the exudation being composed of lymphocytes, histiocytes and plasma cells. The cells of the cortex show peculiar degenerative changes, which although not specific, occurred in all the suprarenals examined, and are characterized by the appearance of roundish or longish basophil granules. The action of the malaria toxin is primarily responsible for the causation of the various histological changes observed in the suprarenals. *E. D. W. Greig.*

See-Lü (Hung). Beitrag zur Phagozytose von *Plasmodium immaculatum* im peripheren Blut. [**Phagocytosis of** *P. immaculatum* **in the Peripheral Blood.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. June. Vol. 38. No. 6. pp. 249–253. With 3 figs.

Observations on phagocytosis of the malarial parasite in 3 fatal cases and 1 other case of malignant tertian infection.

The author notes that so far as he can ascertain phagocytosis of the malaria parasite by lymphocytes has not been previously recorded. From his investigations he concludes that the polymorphonuclear leucocytes play the chief part in the phagocytosis of the parasite, in the second place the monocytes, whilst the lymphocytes take a smaller part. The number of parasites in the polymorphonuclears was one or two, rarely three. The leucocytes are apparently unable to destroy the pigment which remains as a residue. He considers that the phagocytosis by the polymorphs occurs only just before death.

E. D. W. Greig.

Sinton (J. A.). **The Standardization of Mixed Preparations of the Cinchona Alkaloids in Relation to Indian Conditions.**—*Records of the Malaria Survey of India.* 1934. Mar. Vol. 4. No. 1. pp. 5–13.

The author considers that standardization is less necessary in India than in Europe.

"A standardization of the mixed alkaloidal preparations of cinchona bark is to be encouraged. Such preparations seem eminently suitable for mass-treatment among malarious populations who cannot afford more expensive drugs and who cannot easily obtain medical advice." The production of a permanent cure of one infection, in tropical countries where fresh infections with several strains are frequently taking place, seems useless and even inadvisable; but the investigations of Mulligan and Sinton (see above, p. 462, and Vol. 30, p. 831) into monkey malaria suggest that if a patient can be tided over the acute primary attack and the earlier relapses by means of treatment, the infection will become latent and he will become tolerant of it; in the same way, if assisted by treatment of the acute attacks, he will become tolerant of other local strains. Such drugs as cinchona febrifuge and totaquina, which are cheaper than quinine, are suitable for the purpose of such treatment. These drugs are, at present, prepared from the residual alkaloids left after most of the quinine has been extracted from the quinine-rich bark of *C. ledgeriana*, together with some added quinine. The quantity of these residual alkaloids is limited, and an increased demand for them will send up the price. When the Madras Commission of 1866 reported that certain of the other alkaloids of cinchona bark were as good as quinine for the treatment of malaria, the price of these alkaloids immediately rose to be equal to, or even greater than that of quinine. A supply of alkaloids for the manufacture of totaquina could be provided by cultivating the hardy *C. succirubra* and *C. robusta*, which could be grown in most malarious countries in the tropics; but such new plantations would not yield bark for years to come, and there are many questions to be considered before a large extension of planting is undertaken. For example, some new synthetic drug might be discovered, as useful as totaquina and at a lower price; again, a fall in the price of quinine might make the new plantations commercially unsound. The author doubts whether it is necessary, in India, to use the standardized totaquina, in place of the less expensive cinchona febrifuge. In India, all the febrifuge is manufactured in government factories and it is not subject to the same variations as it is in countries where it is obtained from many different sources. Standardization increases the cost of production. The cost of production of cinchona febrifuge, totaquina, and quinine sulphate in India are in the proportions of about 1, 2, and 3, respectively, More benefit to the population might result from a wider use of the cheaper febrifuge than from a more limited use of the standardized totaquina. The author concludes that standardization is a question of much more urgent import under European conditions than in a country like India, which manufactures its own product. *W. F.*

Indian Medical Gazette. 1934. Apr. Vol. 69. No. 4. pp. 215–217.—**The Total Cinchona Alkaloids.**

The following occurs in this Editorial. "The only useful function totaquine (Type II) appears to perform is to provide the quinine manufacturer with a means of disposing of his residue . . . we think it is a pity that the name 'totaquina' should have to bear the stigmata that it will acquire if the quinine manufacturers are allowed to place this poor-quality antimalarial on the market under this name." But tests carried out in Kuala Lumpur and elsewhere have shown that when totaquina (type II) is given in ordinary doses, there is little, if any, difference between it and quinine. Moreover it is the only type of

totaquina available in any quantity, and will probably remain so until cinchona trees have been grown for the production of type I. (See this *Bulletin*, Vol. 30, p. 76). *W. F.*

Decourt (P.). Première note sur l'action comparée de la quinine et de divers corps synthétiques sur les gamètes du *Plasmodium falciparum*. [**The Action of Quinine and Various Synthetic Drugs upon Crescents.**]—*Bull. Soc. Path. Exot.* 1934. Mar. 14. Vol. 27. No. 3. pp. 243–246.

Quinacrine destroys M.T. schizonts and has also some action on crescents. Rhodoquine destroys the crescents.

Quinine treatment, by intramuscular or subcutaneous injection, was given to 68 patients suffering from subtertian malaria, with the result that though the rings disappeared the crescents persisted in 67.

Quinacrine (866 R.P.), like quinine, was active against the schizonts but did not cause the crescents to disappear ; unlike quinine, it was not entirely without action on the latter, for it produced a reduction in their numbers and a degeneration of their substance. A preliminary course of quinine appeared to sensitize the crescents to the action of quinacrine which was then able to bring about their speedy degeneration, and, within 3 or 4 days, their complete disappearance. The doses given were 0·3 or 0·4 grams daily, for 5 to 8 days.

The quinoline derivative 710F., or rhodoquine, may cause toxic symptoms if it is given in doses of 0·04 or 0·06 grams, but, if a preliminary course of quinine or quinacrine is given to destroy the schizonts, a three-days' course of 0·03 grams of rhodoquine daily will be sufficient to destroy the crescents. In a group of 24 cases treated by the author, none showed toxic symptoms. (See above, pp. 432–3.) *W. F.*

Barrowman (Barclay). **Tebetren in the Treatment of Malaria.**—*Malayan Med. Jl.* 1933. Dec. Vol. 8. No. 4. pp. 257–260.

The author obtained excellent results with tebetren in the treatment of 50 cases—27 B.T. ; 21 M.T. ; 2 quartan.

Tebetren is prepared " for the Proprietors, Chemopharm Limited, by Howard and Sons Limited, London. It is said to be a compound of acridine and quinine derivatives with a derivative of cholic acid and to contain 83 per cent. of salts of quinine alkaloids." (See this *Bulletin*, Vol. 30, p. 201). The patients were given 3 tablets, each weighing 3 grains, three times a day for six days. The author concludes that its curative effect is rather less rapid than quinine, but more rapid than atebrin, and that the number of permanent cures after 6 days' treatment is greater than that which follows a three months' course of quinine. He also concludes that " tebetren is parasiticidal to both sexual and asexual forms of all types of malaria parasites."

The daily dose given was 27 grains, 83 per cent. or 23·4 grains of which consisted of quinine salts. It is stated in a footnote that, " in one later case there has been no apparent effect on crescents which are still persisting 22 days after treatment." *W. F.*

Missiroli (A.) & Mosna (E.). Sulle proprietà terapeutiche di un prodotto derivato dalla chinina : C.77-Giemsa. [**Giemsa "C 77", a Derivative of Quinine.**]—*Riv. di Malariologia*. 1934. Vol. 13. No. 2. pp. 148–160. With 2 figs. English summary (9 lines).

" The authors have experimented on 31 cases of malignant tertian malaria the value of a new drug " C 77 " that has been obtained by Giemsa

from the condensation of hydrocuprein with a diazotized chloride. The drug C 77 has not shown any secondary effects on the nervous system, such as those arising from quinine (trembling, buzzing, etc.). This new drug administered in smaller doses than those of quinine has shown an equal efficacy on the attack of fever, on the disappearance of malarial parasites from the peripheric blood and in preventing relapses." *W. F.*

MÜHLENS (P.). **Modern Methods of the Treatment and Prophylaxis of Malaria by Medicaments.**—*Chinese Med. Jl.* 1933. Nov.–Dec. Vol. 47. Nos. 11 & 12. pp. 1401–1410.

The author gives details of the therapeutic and prophylactic treatment prescribed in the Hamburg Institute for Tropical Diseases.

Plasmoquine was made synthetically by SCHULEMANN, SCHONHOFER and WINGLER in 1925, at the Elberfeld Laboratories which are under the direction of HOERLEIN. It was tested on birds by ROEHL, on general paralytics infected with *P. vivax* by SIOLI, and on cases of malaria by the author and his colleagues in the Tropical Institute at Hamburg. Atebrin was synthesized by MIETZSCH and MAUSS at Elberfeld in 1930. It was tested by KIKUTH on birds, and on human malaria by SIOLI, PETER, the author and others.

The following therapeutic treatment for malaria is recommended :—

Benign Tertian and Quartan.—(*a*) Atebrin 0·1 gram, three times a day for 7 days, or, (*b*) Quinoplasmoquine 1 tablet, three times a day for 21 days.

Subtertian.—(*a*) Atebrin 0·1 gram, three times a day for 7 days. Then atebrin 0·1 gram together with plasmoquine 0·01 gram, three times a day for a further 3 days—making 10 days' treatment in all. An alternative treatment is quinoplasmoquine 1 tablet, three times a day for 21 days. Relapses in all forms of malaria with this treatment at the Hamburg Institute were less than 10 per cent. In all comatose cases, and in those with a large number of parasites, it is advisable to begin immediate treatment with injections of quinine, or quinoplasmoquine [injections of atebrin are not mentioned].

The following prophylactic treatment is recommended :—(1) one tablet of quinoplasmoquine, or two tablets of plasmoquine compound, daily while in a malarious zone and for four weeks after leaving it. Or, (2) Quinine hydrochloride grains 3 and grains 6 on alternate days while exposed to infection, and for four weeks afterwards.

A tablet of plasmoquine compound contains 0·125 grams (2 grains) of quinine and 0·01 grams of plasmoquine. A tablet of quinoplasmoquine contains 0·3 grams (4½ grains) of quinine and 0·01 grams of plasmoquine. There are no exact observations on the question of atebrin prophylaxis, but as it is excreted in the urine for 3 or 4 weeks after the last dose it probably has a long protective action [see SOESILO below].

W. F.

MORISHITA (Kaoru), MIYAHARA (Hatsuo) & ISHIOKA (Hiozo). **On the Specific Effect of Various Drugs on the Parasitic Types of Malaria based on the Occurrence of Parasitic Relapses.**—*Kitasato Arch. Experim. Med.* 1934. Jan. Vol. 11. No. 1. pp. 10–35.

Plasmoquine, especially in association with quinine, is the best drug for the treatment of benign tertian malaria.

The author has treated comparative series of patients with quinine, with plasmoquine, with plasmoquine and quinine, and with atebrin,

respectively. The patients were kept under observation for 8 weeks ; if no relapse occurred during that period the case was taken as cured. In chronic benign tertian, 60 per cent. relapsed after quinine treatment, 50 per cent. after atebrin, 21 per cent. after plasmoquine, and 13 per cent. after plasmoquine plus quinine. [The numbers are very small ; for example 11 per cent. stands for 1 out of 11, 50 per cent. for 3 out of 6 and so on.] Fewer relapses occurred in early cases treated with quinine. In quartan, 10 per cent. relapsed after quinine, 12 per cent. after plasmoquine and none after atebrin (only 4 cases treated). In subtertian, the relapse rate was 24 per cent. after quinine and 14 per cent. after atebrin. [It appears that some cases of inoculation malaria were included in these series.] *W. F.*

Hoops (A. L.). **A Review of Published Results obtained with Atebrin in the Treatment of Malaria in Malaya. Including a Record of One Year's Treatment of Malaria with Atebrin on the European owned Estates served by the Malacca Agricultural Medical Board.**— *Malayan Med. Jl.* 1933. Dec. Vol. 8. No. 4. pp. 219–235. [28 refs.]

" Atebrin is the best drug available for the treatment of all types of malaria in Malaya."

The author also concludes from the results of treating 594 persons on European owned rubber estates that "Atebrin is infinitely superior to quinine in the prevention of relapses ; judging by present records it may be expected to effect a radical cure in nearly 90 per cent. of benign tertian, and in 95 per cent. of subtertian cases." He uses for injection a solution made by dissolving two 0·1 gram tablets in 5 cc. of normal saline ; this is not followed by pain or unpleasant effects. [Dr. Hoops mentions that quinine bihydrochloride is now in more general use in Malaya than quinine sulphate which is about $3 a pound cheaper. This seems a waste of money.] *W. F.*

Green (Richard). **Toxic Effects associated with the Use of Atebrin.**— *Malayan Med. Jl.* 1934. Mar. Vol. 9. No. 1. pp. 22–30. [13 refs.]

Toxic symptoms are rare, when the usual doses are not exceeded. Certain precautions with regard to treatment are suggested.

Six hundred individuals were treated with atebrin on estates. The total quantity given was 15 tablets for men, 12 for women and a lesser quantity for children. Thirteen hospital patients were given 2 tablets daily for 7 days. None of these 613 persons suffered from toxic symptoms.

One hundred and seventeen hospital patients were given 3 tablets a day for 7 days, or 21 tablets in all, and among them the following symptoms were found either during the treatment or the subsequent period of observation : (*a*) Abdominal pains, 6 cases (2 severe, 4 mild) ; (*b*) yellowness of the skin, 1 case (slight) ; (*c*) headache 4 cases (1 severe, 3 slight) ; (*d*) cerebral excitation, 2 cases. These last two subjects sang and danced, as though they were under the influence of alcohol ; in one instance, the attack came on at the end of the course, and in the other a few days later ; recovery took place after a few hours. Twenty hospital patients were given larger doses—4 tablets daily for 7 days. One of these 20 had severe abdominal pain and 6 had yellowness of the skin.

The author recommends that atebrin should be given 2 or 3 hours after a meal, and that it should be preceded by a dose of some mild saline. The patient should be encouraged to drink, and "glucose, if thought desirable, could be given as early in treatment as possible." There seems to be a connexion between toxic symptoms and the late appearance of atebrin in the urine. It usually appears on the third day; if none is present on the morning of the fourth day, treatment should be stopped. The yellow colour of atebrin can be demonstrated in urine by adding a few drops of acetic acid, heating, and looking down the test-tube against a black background. During treatment and for about 7 days afterwards, toxic drugs such as chenopodium should not be given. The addition of plasmoquine increases the risk of toxic symptoms. Touching the prophylactic effect of plasmoquine in a community, the author thinks that "it will be admitted that suitable conditions for the effective carrying out of such prophylaxis are not commonly met with, or, if created, are difficult to maintain."

In the discussion which followed, Dr. W. T. QUAIFE stated that he had suffered from severe persistent headache while taking atebrin, and that 4 out of 165 patients treated by him had also suffered from headache. Dr. A. L. HOOPS said that he had seen severe persistent colic caused by plasmoquine and atebrin when given together; he now gave plasmoquine after the atebrin course was completed. In his experience, some 5 per cent. of those treated with atebrin suffered from colic on the fifth day of treatment, but it disappeared after a purge. Dr. B. BARROWMAN stated that colic was most frequent and severe in Europeans and other meat-eaters. It is evident that atebrin is very widely used on the rubber estates and in the hospitals of the Malay States. *W. F.*

SOESILO (R.). Een proefneming met atebrin "te velde" (3e mededeeling). [**Test of Atebrin in the Field.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1934. Mar. 27. Vol. 74. No. 7. pp. 394–411. English summary.

Small doses of atebrin, three times a week, reduced the parasite index of children to zero in an endemic area.

A group of 74 children who were constantly exposed to infection in a highly endemic area were given small doses of atebrin 3 times a week, for 13 weeks. Forty-two children who were more than 3 years old had a parasite index of 55, but, after 3 weeks' treatment, all parasites had disappeared. The children under 3 numbered 32, and their parasite index was 81 at the beginning of the experiment; but it declined steadily, and no parasites could be found later than the twelfth week. In a control group of 68 children, the index was 73·5 at the beginning and 60·7 at the end of the experiment. There were no toxic symptoms.

W. F.

MAYER (Martin). Fortschritte der Malaria-Behandlung mit den synthetischen Heilmitteln Atebrin und Plasmochin. [**Progress of Malarial Therapy with the Synthetic Drugs Atebrin and Plasmoquine.**]—Reprinted from *Fortschritte d. Therapie.* 1934. Vol. 10. No. 1. pp. 25–30. [22 refs.]

A summary of experiences with atebrin and plasmoquine in the treatment of the different varieties of malaria.

The author first deals with atebrin and records the experiences of various workers on the subject. He then discusses the combined therapy with atebrin and plasmoquine, plasmoquine and chinoplasmoquine, and finally the prophylaxis of malaria with atebrin and plasmoquine. There is nothing essentially new and the facts concerning the drugs are now pretty well known, but for those who wish a concise summary of the literature of the subject this paper will be found useful.

E. D W. Greig.

Sapeika (Norman). **The Action of Atebrin on the Uterus.**—*Quarterly Jl. Pharm. & Pharmacol.* **1934.** Jan.–Mar. Vol. **7.** No. **1.** pp. **41–43.** With 2 figs.

The results of these experiments were as follows :—

" Atebrin stimulates the uteri of guinea-pig, rabbit and cat in weak concentration and inhibits the isolated strips in strong concentration. The uterus of the rat is inhibited. The action is apparently directly on the muscle.

" In antimalarial therapy, atebrin is probably safe for women, as evidenced from experimental results and clinical trials." *A. G. B.*

Massias (Charles). Paludisme à *Plasmodium vivax* et à *Plasmodium praecox*. (Expérimentation thérapeutique, 574 et quiniostovarsol. [**574 and Quiniostovarsol Treatment.**]—*Jl. Physiol. et Path. Gén.* 1933. Dec. Vol. 31. No. 4. pp. 1061–1086. With 42 charts.

The author prefers 574 to 710 because it is less toxic, and because it is more stable in a tropical climate. Cachets kept for 8 months have not deteriorated. Only two patients out of 43 vomited, and the drug was taken with impunity during pregnancy. Association with quiniostovarsol decreased the toxicity. No albuminuria, jaundice, or haemoglobinuria occurred in the cases treated.

The dose for adults is 0·04 grams of 574 plus 0·5 grams of quiniostovarsol twice a day after food for 7 days, followed by a second course, if necessary, after a week's interval. A drink of Vichy water or sodium bicarbonate is given after each dose. The author has not seen any cases in which the parasites resisted 7 days' treatment, in either benign or subtertian infections, and the drug appears to act like plasmoquine upon the crescents. (See above, p. 430.) *W. F.*

Sergent (André) & Vogt (P.). De l'action de deux produits synthétiques, la rhodoquine et la quinacrine, sur le *Plasmodium praecox* aux différents stades de son évolution. [**Action of Rhodoquine (F. 915) and Quinacrine (R. P. 866) on** *P. falciparum*.] *C. R. Soc. Biol.* **1934.** Vol. **115.** No. **10.** pp. **1101–1102.**

—— & ——. Expérimentation du " **915** Fourneau " ou rhodoquine U contre la tierce maligne à *Plasmodium praecox* d'Algérie.—*Arch. Inst. Pasteur d'Algérie.* **1934.** Mar. Vol. **12.** No. **1.** pp. 13–21.

F. 915 acts on all forms of *P. falciparum*, including crescents. R.P. 866 resembles atebrin.

Rhodoquine (Fourneau 915) resembles plasmoquine, but differs from it in being potent not only to destroy the gametocytes but also the trophozoites of subtertian malaria. In 33 cases treated with 0·6

gram daily, both rings and crescents disappeared in two or three days.

Quinacrine (R. P. 866) is the dichlorate of chloro-2-diethylamino-pentylamino-5-methoxy-7 acridine. Its action upon the parasites of subtertian malaria resembles that of atebrin. Twenty-one patients were given 0·3 gram daily, in three doses, for 5 days, with the result that both fever and asexual parasites disappeared, but the crescents were unaffected. [The name Rhodoquine is now reserved for F.710. (See above, pp. 432–3).]. *W. F.*

i. Tareev (E.), Epstein (E.), Pikul (I.), Gontaeva (A). & Raskin (A.). Résultats des essais cliniques avec les produits Soviétiques synthétiques antipaludéens de série de quinoléine. [**Treatment of Malaria with Quinoline Products.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. Nos. 4–5. pp. 189–210. [In Russian. French summary p. 210.]

ii. Leiserman (L.). Sur le traitement du paludisme avec le dérivé de quinoléine No. 14. Note préliminaire.—*Ibid.* pp. 210–214. [In Russian. French summary p. 214.]

iii. Miloslavski (M.). Les nouvelles préparations quinoléiques dans le traitement du paludisme et les limites de leur efficacité.—*Ibid.* pp. 215–219. [In Russian. French summary p. 219.]

These three papers describe the results of the treatment of malaria with compounds belonging to the quinoline group synthetized and manufactured in Soviet Russia. The most satisfactory results were obtained with " plasmocide " which is a methylene-bis-salicylate of 6-methoxy-8-(γ-N-diethylamino-propylamino)-quinoline, analogous to Fourneau 710.

i. Tareev and his collaborators (i) tested the drug in 94 cases and found that it caused a rapid disappearance from the peripheral circulation of the gametocytes in malignant tertian, and of all the stages in benign tertian and quartan malaria, in Q and BT a complete clinical cure was obtained in the majority of cases, whereas in MT and in hypertoxic forms of BT it was necessary to combine plasmocide with quinine treatment. The parasiticidal and therapeutic effects of plasmocide are similar to those of the German plasmoquine, but it is less toxic than the latter.

ii. & iii. Similar results were obtained by Leiserman (ii) in 16 cases and by Miloslavski (iii) in 60, representing all the three forms of malaria.

C. A. Hoare.

Kritschewski (I. L.) & Pines (A. I.). Die Wirkung der Chinolin-derivate auf die Gametocyten von *Plasmodium praecox*. [**Action of Chinolin Derivatives on** *Plasmodium praecox*.]—*Klin. Woch.* 1934. June 2. Vol. 13. No. 22. pp. 807–809.

A study of the action of chinolin derivatives on bird malaria.

The authors conclude that :—Plasmoquine given to *Spinus spinus* in 1 to 1,000 concentration destroys the power of the gametocytes to infect *Culex pipiens* in 12 to 24 hours after treatment. Plasmocide (6-methoxy-8-diethylaminopropylaminoquinoline) given to *Spinus spinus* in a concentration of 1 to 1,500 has a similar action. Neither plasmoquine nor plasmocide given in concentrations of 1 to 4,000 or 1 to 8,000 to *Spinus spinus* at the height of infection with *Plasmodium praecox* can destroy the power of gametocytes to infect *Culex pipiens* 24 to 28 hours after administration. So that both these, and probably

all chinolin derivatives, have the extremely valuable property of breaking the epidemiological chain which links the malarial vector with the object of infection. *E. D. W. Greig.*

Sternberg (E. J.). Ueber die Wirkung des Präparates " R 123 " gegen Vogelmalaria. [**The Action of " R 123 " on Bird Malaria.**] —*Ztschr. f. Hyg. u. Infektionskr.* 1934. Mar. 20. Vol. 116. No. 1. pp. 1–3.

Observations on the action of a preparation of the quinine series, " R 123," on bird malaria.

In his tests the author did not employ canaries but siskins (*Spinus spinus*) and flax siskins (*Acanthis linaria*). The chemical formula of the preparation was not divulged. As a result of his experiments the author finds that the preparation is weaker than plasmoquine in its action on bird malaria, the chemotherapeutic index of " R 123 " being 26·6, whilst that of plasmoquine is 40. *E. D. W. Greig.*

Buttle (Gladwin Albert Hurst), Henry (Thomas Anderson) & Trevan (John William). **The Action of the Cinchona and Certain Other Alkaloids in Bird Malaria. II.**—*Biochem. Jl.* 1934. Vol. 28. No. 2. pp. 426–441. [18 refs.]

The action of the different alkaloids of cinchona bark in bird malaria showed that they were not equally efficient.

The authors used Roehl's method with canaries in an investigation of the relative efficiency of the 8 principal alkaloids of cinchona bark, viz.: *l*-quinine, *l*-cinchonidine, *d*-quinidine, *d*-cinchonine, and the 4 dihydro-derivatives of each of these products known commercially as hydroquinine, hydrocinchonine, etc.; but referred to in this paper as dihydroquinine, etc. The drugs were given orally through a thin piece of rubber tubing. The first dose was given 4 hours after the injection of a strain of bird malaria. Subsequent doses were given at daily intervals for the next 5 days, making 6 doses in all. The potency was estimated in comparison with that of quinine by taking the average time after infection at which parasites appeared in a particular group, and comparing it with the average of the quinine group done at the same time. There appeared to be little difference in the toxicity of the different alkaloids; dihydroquinidine was possibly a little more toxic than the others. In the following table, the drugs are arranged in order of their therapeutic efficiency. The figures represent the dose of quinine necessary to produce the same amount of protection as unit dose of the other alkaloids; for example 0·2 parts of quinine had the same effect as 1 part of cinchonine.

Dihydroquinine 1–2.
Quinine 1.
Dihydroquinidine 0·5–1.
Cinchonidine about 0·5.
Quinidine about 0·5.
Cinchonine less than 0·2.
Dihydrocinchonine less than 0·2.
Dihydrocinchonidine less than 0·2.

It is not claimed that the order in which the drugs are arranged in this table necessarily represents the order of antimalarial activity in man. But it is logical to assume that, if the alkaloids differ so much in their activity on the parasite experimented with, they will not be of equal therapeutic value in man.

Commercial samples of the primary cinchona alkaloids are impure ; each alkaloid contains its own reduction product ; for example, quinidine contains about 20 per cent. of dihydroquinidine, and cinchonine contains about 14 per cent. of dihydrocinchonine. This is even the case in well crystallized specimens, usually accepted by chemists and biologists as pure. Another type of impurity is due to the difficulty of completely separating the components of each of the two similarly optically active pairs from each other, *i.e.*, cinchonidine and quinine usually contaminate each other, as do quinidine and cinchonine. (See this *Bulletin*, Vol. 30, p. 849.) *W. F.*

Chopra (R. N.) & Gupta (B. M. Das). **Studies on the Action of Quinine in Monkey Malaria.**—*Indian Med. Gaz.* 1934. Apr. Vol. 69. No. 4. pp. 195–203. With 4 figs.

The immediate response to quinine is slower than that to atebrin, but if the monkey survives it is much less likely to relapse after quinine.

P. knowlesi produces an intense and fatal infection when inoculated into rhesus monkeys. Treatment with atebrin quickly causes the disappearance of parasites but, even after a 5-day course with large doses, the parasites reappear within 10 to 15 days and the animal dies if left untreated ; the recrudescence is, however, easily controlled by a single dose of atebrin. Quinine acts much more slowly than atebrin. In very heavy infections, death may take place in spite of a single daily intravenous injection of the largest doses tolerated, probably because quinine disappears so quickly from the blood ; but quinine injections are very effective if they are repeated every 4 or 5 hours. The results with intramuscular injections are rather better. Unlike treatment with atebrin, treatment with quinine is not regularly followed by relapse. In many cases there is none, and in those where it occurs it is usually mild and tends to spontaneous cure though there are occasional fatal cases.

W. F.

Pavlova (P.). Der Einfluss der einmaligen Chiningabe auf den K- und Ca- Gehalt im Kaninchenserum. [**Effect of Single Doses of Quinine on the K and Ca Content of Rabbit Serum.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. Nos. 4–5. pp. 258–260. [In Russian. German summary p. 260.]

The authors estimated the potassium and calcium content in the serum of rabbit before and after the introduction of quinine into the blood. A physiological solution of saline containing 2 per cent. quinine hydrochloride was injected subcutaneously into seven rabbits in doses containing 0·0016 gm. per kilo of body-weight. It was found that after ½ hour the K content increased (by 8·8 per cent.), while the Ca content remained unaltered ; after 2 hours the K content decreased by 7·3 per cent. though remaining above the normal, but there was an increase of 14·1 per cent. of Ca. *C. A. Hoare.*

Warasi (W.). Ueber das Problem der Chininwirkung. [**On the Action of Quinine.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. June. Vol. 38. No. 6. pp. 222–232. [37 refs.]

An experimental study of the adsorption of quinine by the red cells.

The author concludes from his observations that :—The adsorption of quinine by the red cells of the blood is proportional to the quinine

concentration when the quantity of red cells is constant; conversely the adsorption is proportional to the quantity of red cells when the quinine concentration is constant. The absorption coefficient of red cells for quinine equals 14·7. Carbon dioxide does not displace quinine from the red cells. Arsenic lowers the adsorption power of red cells for quinine. By the action of quinine the colour of the red cells goes from light to dark red (methaemoglobin), but in the presence of arsenic the colour of the red cells remains light red. This appearance can be used as an indicator for detecting the action of arsenic on quinine adsorption by red cells. *E. D. W. Greig.*

Boyd (Mark F.) & Stratman-Thomas (Warren K.). **On the Duration of Infectiousness in Anophelines harboring** *Plasmodium vivax*.—*Amer. Jl. Hyg.* 1934. Mar. Vol. 19. No. 2. pp. 539–540.

No infection was conveyed by mosquitoes in whose salivary glands sporozoites had appeared more than 50 days before their application.

The results obtained in infecting man by the bites of mosquitoes are not so good in the first ten-day period as in the second ten-day period following the appearance of sporozoites in the salivary gland of the mosquito. After 20 days, the effectiveness of the mosquitoes deteriorates, and the authors have not succeeded in conveying infection after 50 days. The mosquitoes were kept in cold storage and fed once a week on rabbits. Depletion of sporozoites through these feeds undoubtedly occurred, but deterioration was also a factor. Sporozoites in recently matured infections are almost straight; those in old infections are curved. *W. F.*

Robin (L. A.) & Toumanoff (C.). Premières notions sur la réceptivité expérimentale de quelques anophèles de la Cochinchine et particulièrement de *A. vagus*, Dön. [**Infectibility of** *A. vagus* **in Cochin-China.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1934. Feb. Vol. 12. No. 2. pp. 245–252.

Anopheles vagus Dön. was readily infected experimentally with *P. falciparum*. The absence of infection among the very large numbers of this species examined in Cochin-China cannot, therefore, be due to incapacity for infection, but must be attributed to its feeding on animals and not on man. This hypothesis was supported by precipitin tests which showed that buffalo blood was the commonest meal of this mosquito. *W. F.*

Rozeboom (L. E.) & Shah (K. S.). **Preliminary Studies on the Production of Bird Malaria Infections by the Injection of Sporozoites.**—*Jl. Parasitology.* 1934. Mar. Vol. 20. No. 3. p. 198.

Mosquitoes (*Culex pipiens*) were fed on canaries infected with *Plasmodium cathemerium*. The mosquitoes were dissected 15 days later, and suspensions of glands containing live sporozoites were made in Locke's solution. Clean canaries were inoculated with various quantities of this suspension, and it was found that only those birds who received more than 200 sporozoites became infected. Birds with latent infections could not be superinfected by the inoculation of sporozoites. The sporozoites did not remain alive for more than about 2 hours at a temperature of 5°C. *W. F.*

SCHILLING (Claus). Antikörper und Anfangsfieber bei Malaria. [**Antibodies and Initial Fever in Malaria.**]—*Zent. f. Bakt.* I. Abt. Orig. 1934. Feb. 28. Vol. 131. No. 1/2. pp. 25–33. With 4 figs.

In this communication the author elaborates a hypothesis of the pathogenesis of malaria.

The introduction of malaria therapy by WAGNER VON JAUREGG has made possible a direct attack on the problem of the interchanges between the antigen of the parasite and the metabolic products of the body. The author refers to his previous work in this connexion and also to the recent investigation of NEUMANN on antibodies and immunity in human malaria [this *Bulletin*, Vol. 30, p. 859].

His hypothesis of malaria is built up on the following data :—The demonstration of antibodies during the paroxysm (NEUMANN), the peculiar course of the initial fever, the typical intermittent fever following, the failure of initial fever in relapses and reinfections.

In discussing his hypothesis of the pathogenesis of malaria the author states that the results of the malarial infection express themselves in manifestations due to the action of toxin, and to the production of antibodies. The toxic symptoms arise when the amount of toxin has reached a certain threshold limit. At this time the number of circulating parasites varies very greatly in different persons : it is not the number of parasites and, probably, not the amount of toxin which determine whether or not the body will show a febrile reaction, but the sensitiveness of the infected individual. Therefore the period between the infection and the first rises of temperature (precubation of Wethmar, incubation I of van Assendelft) varies greatly. The initial febrile paroxysms vary so much in individuals that van Assendelft described 5 types.

The toxin acts longer in malignant tertian than in benign tertian or quartan infection and this is probably explained by the fact that the *P. falciparum* withdraws into the internal organs and is less exposed to antibodies circulating in the blood. The similarity of the subjective and objective symptoms indicates that the same toxin is produced by the different generations of parasites.

The second function of the parasite is the antiparasitic antigen ; this in the author's opinion originates from the bodies of lysed parasites.

In the incubation period and in the initial febrile attacks a struggle between the antigen and antibodies is taking place. The most marked rise in the parasite curve is always at the end of the incubation period and beginning of the febrile attacks. This is due chiefly to the unhindered increase of an antibody-resistant generation. The typical febrile reactions are produced by antibody resistant generations of parasites.

He explains the failure of second inoculations, where no febrile attacks occur, only a few parasites in the blood, by the conception that the increase of parasites is hindered by a residue of antibodies and that the toxin production does not reach the necessary threshold limit ; a low rate of increase reduces the probability that antibody-resistant generations can be formed.

van Assendelft notes that in cases of second infection which had previously undergone treatment or who gave a definite history of malarial attacks (called by him relapse cases, but more correctly designated fresh infections) the malarial paroxysm starts in about 90 per cent. of the cases without preliminary temperature rises. Here there is a generation of parasites which has reached a certain degree of resistance to antibodies settled in the body of the host, which has a residue of protective bodies and from the previous infection has become allergic. This explains the cases in which repeated injection of blood containing parasites fail to produce attacks, but the bite of an infected anopheles leads to infection.

He notes that the experimental basis of his hypothesis shows considerable lacunae ; nevertheless he believes that by stating the

problem other investigators may be stimulated to test it experimentally. The detailed discussion of the author's views should be read in the original paper by those interested. *E. D. W. Greig.*

Tareev (E.), Epstein (E.) & Gontaewa (A.). Zum Studium des Biochemismus der Rezidivbereitschaft bei Malaria. [**Biochemical Basis of Malarial Relapse.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. No. 3. pp. 170–177. [In Russian, German summary p. 177.]

With the view to throwing some light on the biochemical basis of malarial relapses the authors have analysed the blood of 40 malarial cases (of all the three varieties) with special reference to the decrease of cholesterin, increase of sugar and decrease of reserve alkalinity, all of which are regarded as the usual concomitants of malarial infection. It was found that fresh and relapse cases of acute malaria are characterized by insignificant fluctuations of blood sugar and reserve alkalinity whereas there is a pronounced diminution of cholesterin. The degree of hypocholesteraemia depends primarily upon the number of attacks immediately preceding the examination of the patient. A comparison of persistently relapsing cases of malaria with a number of mild ones revealed no difference between the two groups as regards the figures for cholesterin, sugar and reserve alkalinity. It would thus appear that the biochemical deviations of the blood have no prognostic value and cannot serve as a clue to the constitutional factors governing the malarial process. *C. A. Hoare.*

Tschilow (Konstantin) with Mladenow (Iw.). Beitrag zur Funktion der Leber bei Malaria. Belastung mit Galaktose und kombinierte Belastung mit Insulin-Glykose-Wasser. [**Liver Function in Malaria.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. July. Vol. 38. No. 7. pp. 282–287. With 6 figs.

The authors tested the liver efficiency in malaria by three methods and record the results.

Firstly they administered to 12 malarial patients 40 gm. of galactose per os and tested the urine thereafter. The urine contains only a little sugar if the liver is normal, but if there is liver damage then over 3 gm. may be found. In the malaria cases examined the reaction was negative ; the urinary sugar never exceeded the physiological limits. Secondly they examined the blood sugar after administration again of 40 gm. galactose ; a rise of 30 mgm. per cent. above the fasting blood sugar level indicates diminished efficiency of liver function. In the malaria cases it was found that either the rise of blood sugar was within normal limits, or it exceeded that level with, at the same time, pathological galactosuria, which indicated a disturbance of liver function. Thirdly, having determined the fasting blood sugar level, 20 units of insulin were injected, 20 minutes later the patients received 50 gm. glucose in 500 cc. water and then water up to 1,000 cc. per os. The blood sugar level was determined at intervals of 36, 60, 120 and 180 minutes thereafter. During the period of investigation the patient remains fasting. The difference from the fasting sugar level should not exceed 20 mgm. per cent. ; in patients with damaged-liver the difference exceeds this quantity. In the malaria cases examined some showed no abnormality, but in the majority of cases a disturbance of

liver function was determined by the test, the difference between the fasting sugar level and the peak of the hypoglycaemic blood sugar level exceeding 25 mgm. per cent. In many malarial cases there was a delay in reaching the normal maximum of the blood sugar level.

E. D. W. Greig.

SERGENT (Edm.), SERGENT (Et.) & CATANEI (A.). Essais de vaccination prémunitive contre le *Plasmodium relictum*. [**Premunition against *P. relictum* by Vaccination.**]—*Arch. Inst. Pasteur d'Algérie*. 1934. Mar. Vol. 12. No. 1. pp. 10–12.

Blood rich in *Plasmodium relictum* was mixed with citrate solution and glycerine, and kept at room temperature for varying periods before being inoculated into canaries. Blood which had been kept for 2 or 3 days retained its virulence, but blood which had been kept for 4 days produced no disease and seldom premunition. Thirteen birds were inoculated with blood 4 days old, and premunition occurred in only one. Better results have been obtained by inoculating sporozoites. *W. F.*

ISHIOKA (Hyozo). **Isohaemagglutination in Malaria.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1934. Mar. Vol. 33. No. 3 (348). [In Japanese pp. 433–442. With 2 charts. [23 refs.] English summary pp. 35–36.]

The author examined the blood of 23 patients during treatment, and for 8 weeks afterwards. He used his own blood as the standard. He found that, in a healthy man, the titres of haemagglutinin and haemagglutinogen, in *a*-type serum and *b*-type corpuscles remained constant, but that they were lowered in malaria. They rose during treatment and continued to do so afterwards. *W. F.*

PEZZERI (V.). Il metabolismo basale nella infezione malarica. [**Basal Metabolism in Malaria.**]—*Riv. di Malariologia*. 1934. Vol. 13. No. 2. pp. 174–181. [19 refs.] German summary (8 lines).

In 23 cases of malaria where the basal metabolism was investigated, higher values were always obtained during apyrexia in all three types. The author attributes this, firstly, to the access of fever and, secondly, to blood destruction, changes in the vegetative nervous system, circulatory disturbance, and splenomegaly. *W.F.*

MOUFEL (P.) & ANDREEVA-BUDYLINA (V.). Révision de la valeur diagnostique de la réaction cutanée dans le paludisme. [**Diagnostic Value of Skin Reaction in Malaria.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. Nos. 4–5. pp. 256–258. [In Russian. French summary p. 258.]

In 1931 TSECHNOWITZER and MOLDAWSKAYA-KRITCHEWSKAYA published the results of observations on the cutaneous reaction produced with "malaren-antigen" prepared from plasmodia [this *Bulletin*, Vol. 29, p. 717].

The present authors tested this reaction on 62 cases of malaria, with 72 controls, and obtained a positive reaction in 72 per cent. of the former and in 66·6 of the latter. The reaction thus proved to be of no diagnostic value and its use was discontinued. *C. A. Hoare.*

Dhont (C. M.), Jr. Over een serologische reactie op malaria (reactie van Henry). [**Henry's Reaction in Malaria.**]—*Nederl. Tijdschr. v. Geneesk.* 1934. May 19. Vol. 78. No. 20. pp. 2188–2197. With 1 fig. [20 refs.] French summary.

Henry's reaction, first published in 1927, is a sero-flocculation in which the antigenic reagent used is not the cytoplasmic substance of the malaria parasite but the melanin produced by blood destruction. As a matter of fact there are two tests corresponding to two artificial antigenic substances. These are an albuminate of iron and a solution of melanin in distilled water which is obtained from the choroid of the ox's eye. As the first of these two reactions is much less specific than the second there seems little reason to apply both tests. As regards specificity, it may be said that a negative reaction is given by all healthy persons and a positive reaction in all malaria cases, with the melanin solution. In the case of diseases other than malaria, and where there is no malaria history, a positive reaction may sometimes be obtained. Such cases were haemolytic icterus, septicaemia due to haemolytic streptococci, Hanot's hepatic cirrhosis and one very exceptional case of typhoid fever. According to the author's own investigations cases of Weil's disease showed decided tendency to a non-specific flocculation. Whether these exceptional cases are referable to blood destruction, jaundice or disturbance of albumin-globulin equilibrium will require further investigation. Sera with positive Wassermann reaction do not give a Henry's reaction. The reaction has undoubtedly an application, particularly in cases where no parasites are apparent in the peripheral blood. *W. F. Harvey.*

Chorine (V.) & Koechlin (D.). Influence de la conservation des sérums sur la réaction de Henry. [**The Influence of Conservation of the Serum on Henry's Reaction.**]—*C. R. Soc. Biol.* 1934. Vol. 116. No. 16. pp. 19–21.

The authors reach the following conclusions as the result of observations made with the Vernes-Bricq-Yvon photometer upon sera examined over a period of 10 days. In a serum which has been separated from the clot, the reaction varies from day to day in the form of a sinusoidal curve ; but, if the serum is left in contact with the clot, there is a steady, slow decline. The test should therefore be made as soon as possible after the blood has been collected, and the serum should not be separated from the clot until it is needed. The photometric variations in normal sera, and in sera which have been artificially made positive, follow the same course. *W. F.*

Trensz (F.). Le rôle des différents composants du réactif mélanique de Henry dans la séroflocculation palustre. [**The Action of the Different Components of Henry's Melanin Reagent.**]—*Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 333–338.

Pure melanin pigment gives the highest optic densities with Vernes's photometer, but the addition of either vitreous or formalin renders the reaction more readily visible to the naked eye, because it assists in the formation of grosser floccules. *W. F.*

HENRY (A. F. X.). A propos de la densité optique dans les techniques sérologiques, photométriques et en particulier dans la malaria-floculation. [**The Optic Density in Photometric Serology, Particularly in Henry's Flocculation Tests.**]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 14. pp. 1606–1609.

This concerns the reading of the results of Henry's flocculation tests by means of Vernes's photometic methods, and should be read in the original by those who wish to make use of them. *W. F.*

SINTON (J. A.); GHOSH (B. N.). **Studies of Malarial Pigment (Haemozoin). Part I. Investigation of the Action of Solvents on Haemozoin and the Spectroscopical Appearances observed in the Solutions** [SINTON & GHOSH].—*Records of the Malaria Survey of India.* 1934. Mar. Vol. 4. No. 1. pp. 15–42. [94 refs.] **Part II. The Reactions of Haemozoin to Tests for Iron** [GHOSH & SINTON].—*Ibid.* pp. 43–59. [33 refs.]

Malarial pigment, or "haemozoin," differs from the pigment of the skin and eye, or "melanin," and is probably identical with haematin. Most authorities consider that malarial pigment is formed by the digestive action of the parasites upon the haemoglobin of the red cell, the globin being used as nutriment and the haemin remaining as a waste product. Malarial pigment was at one time thought to be identical with the black pigment known as melanin which is found in the skin, the eye and melanotic tumours. Many workers have shown that this view is not correct; true melanin is insoluble in strong ammonia, alkaline and acid alcohol, ammonium sulphide, and several other solvents of malarial pigment. The name "haemozoin," which is now generally used for malaria pigment, was first proposed by SAMBON. Former investigations of haemozoin have been made on pigment derived from tissues preserved in fixatives. The authors have studied it in the blood. They used the blood of a *rhesus* monkey infected with *P. knowlesi*. Infection of this monkey with this malaria parasite is so massive that sometimes half the corpuscles contain parasites, and therefore a good supply of pigment was obtainable. The authors found a very marked resemblance between the action of various solvents upon haemozoin and upon haematin. They studied the spectra of haemozoin in different solutions, and the action of various reagents on such spectra. A comparison of the results with those obtained with haematin showed that they were identical They obtained no evidence of ionisable iron in haemozoin, but they succeeded in demonstrating non-ionisable iron by using a preliminary unmasking treatment with reagents such as H_2O_2, HNO_2 acid alcohol and $(NH_4)_2S$. "A close resemblance has been found between the reactions of haemozoin and haematin with the tests employed. These results support the view that these two pigments are very similar and are probably identical." *W. F.*

TALIAFERRO (William H.); TALIAFERRO (Lucy Graves); CANNON (Paul R.). **The Transmission of *Plasmodium falciparum* to the Howler Monkey, *Alouatta* sp. I. General Nature of the Infections and Morphology of the Parasites** [TALIAFERRO & TALIAFERRO].—*Amer. Jl. Hyg.* 1934. Mar. Vol. 19. No. 2. pp. 318–334. With 3 figs. **II. Cellular Reactions** [TALIAFERRO (W. H.) & CANNON].—*Ibid.* pp. 335-342. With 3 plates. [27 refs.]

Describes the production in monkeys of transient infections with *P. falciparum*, by means of inoculation of large quantities of blood.

Mesnil and Roubaud reported in 1917 the successful transmission of *P. vivax* to a chimpanzee. Parasites were present, in different stages, from the 13th to the 22nd day. Experiments by other workers have been entirely negative, or have caused only fleeting infections, with the exception of those reported by Yoshino (1926) [this *Bulletin*, Vol. 24, p. 276.]

The authors inoculated 9 infant howler monkeys from Herrera, Panama, with citrated, centrifuged, washed corpuscles from 9 cases of subtertian malaria. The monkeys were very small, they weighed only 440 to 645 grams, and they were inoculated intravenously with relatively enormous quantities of blood, 10 to 20 cc.; in one monkey, there were 380 parasites to every 10,000 cells immediately after inoculation. The infections persisted for longer than three days in three of the monkeys. A gradual increase in the cytoplasm of the inoculated subtertian rings took place; occasionally Maurer's dots were seen; within 30 to 40 hours coarse pigment granules appeared; segmentation began when the parasite half filled the cell, and by the time the complete rosette had formed, it filled it completely; there were usually 16 to 24 merozoites. Sporulation occurred approximately every second day; in a monkey whose infection persisted for nearly 6 days, there were 3 sporulation periods characterized by enormous increases in the numbers of the parasites; in one of these accesses there were 915 parasites in 10,000 cells. Only asexual stages occurred; no crescents were found. The fully developed schizonts, or "segmenters" in the peripheral blood were too few to give origin to the large numbers of young ring forms, and the authors found "conclusive evidence of reproductive activity of the parasites elsewhere than in the peripheral blood," namely, in the spleen and to a less extent in the liver and bone marrow. Pigment occurred in the macrophages of the spleen, liver and bone marrow. No general lymphoid activation occurred, and the sluggishness of the tissue reaction suggests that the parasites were disposed of easily. A single attempt was made to convey the human infection from one monkey to another, but it was not successful. [See also this *Bulletin*, Vol. 30, p. 86.] *W. F.*

Ionesco-Miahaiesti (C.), Zotta (G.), Radacovici (E.) & Badenski (G.). Transmission expérimentale à l'homme du paludisme propre des singes. [**Monkey Malaria transmitted to Man.**]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 12. pp. 1311–1313.

A baboon was inoculated with the blood of another baboon infected with *P. inui*, and died 8 days later with a very heavy infection. Some of its blood was inoculated into a *Macacus rhesus* monkey, and some was inoculated intravenously into a human volunteer. The monkey died from malaria on the eighteenth day. The man developed quotidian malaria on the ninth day, and the attacks became so severe that it was necessary to give him an injection of quinine about 10 days later. This caused the disappearance of the parasites, and there was no relapse. Only ring forms were found in the blood. The blood of this man was inoculated into a *Macacus rhesus* monkey, and also into two human volunteers. Parasites appeared in the monkey on the fifth day, and it died five days later. Quotidian fever commenced in the volunteers after 10 days' incubation and, in them, both rings and schizonts were found. *W. F.*

Brug (S. L.). **Observations on Monkey Malaria.**—*Riv. di Malariologia.* 1934. Vol. 13. No. 2. pp. 121–142. With 11 figs.

Natural infections in *Macacus cynomolgus* are not usually pure, but are mixed infections due, for example, to *P. knowlesi* and *P. inui*. Pure infections are obtained by inoculation and subinoculation in monkeys. The author found that the period of the schizonic cycle in *P. knowlesi* was 24 hours. The morphology corresponded to Sinton and Mulligan's description (p. 461, above), but in addition, a halo round the nucleus of the stained parasite was noticed. Another feature was the presence of band-like parasites, resembling those seen in quartan malaria. These occurred in patches, in thin films; they were not seen in thick films probably because the drying was slower and the parasites had time to assume a globular form. On an average, there were 9 merozoites in the schizonts. *P. knowlesi* produced a rapid anaemia in *Macacus rhesus*: for example, in one monkey, 5,700,000 corpuscles on the 11th day sank to 1,660,000 on the 15th day. The number of corpuscles destroyed was far greater than the number of parasites present, and the author attributes their destruction to a toxin produced by the plasmodia. In the naturally infected *Macacus cynomolgus* from which this strain was isolated, the infection was very scanty, and, though it persisted, the animal appeared quite healthy. One strain investigated by the author differed from typical *P. knowlesi* in the following particulars:—(1) the corpuscles were rarely distorted, (2) the pigment was in the form of rods, (3) the parasites had purple stained borders, like those seen round crescents. He calls this form *P. knowlesi* var. *sintoni*.

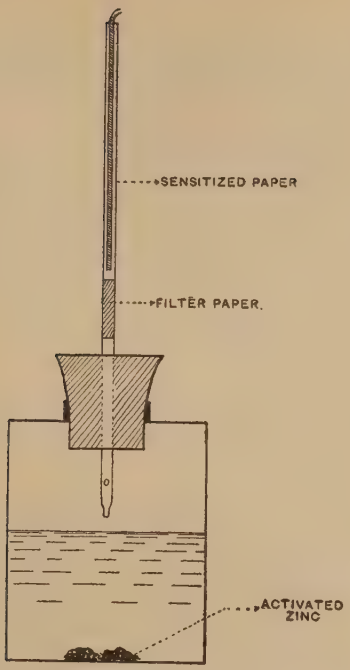
The investigation of *P. inui* was handicapped by the death of the monkeys from intercurrent infections. The plasmodial infections were slight, and appeared to have little effect on their health. The periodicity was tertian. The occurrence of Schüffner's dots was not nearly so constant as in human tertian. *W. F.*

Schwetz (J.). Contribution à l'étude des parasites malariens des singes supérieurs africains. [**Malaria Parasites in African Apes.**]—*Riv. di Malariologia.* 1934. Vol. 13. No. 2. pp. 143–147. With 29 coloured figs. on 1 plate.

The author has kept under observation two chimpanzees with naturally acquired, multiple infections. The first, examined over a period of 10 months, was naturally infected with benign tertian, subtertian, and quartan parasites. The second, which was about six months old was naturally infected with *P. falciparum* and *P. vivax*. The parasites were absolutely identical (? morphologically) with the human forms. The benign tertian and quartan infections died out comparatively early, while the subtertian persisted much longer. The same thing happens in the human population. *P. tenue* forms were found in both monkeys. An excellent coloured plate is given. (See p. 461, above.) *W. F.*

Monnier & Martin. Contribution au contrôle chimique de l'épandage du vert de Paris pour la destruction des larves d'anophèles. [**Chemical Control of the Distribution of Paris Green.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1934. Feb. Vol. 12. No. 2. pp. 253–262. With 2 figs.

The sample of water which is to be tested for Paris green is cooled to 15°C., if necessary, and 50 cc. are put into the glass flask, shown in



Showing wide-mouthed glass flask, of about 120–150 cc. capacity, fitted up for testing water samples for Paris green. A glass tube, 30 cm. long by 6 mm. diameter, with a small hole, 3 mm. in diameter, at about 2 cm. from its tapered end passes into the flask through a rubber stopper. Above the stopper this tube contains first a wad of filter paper and then a strip, 10 cm. long, of paper impregnated with mercuric chloride.

[Reproduced from the *Bulletin de la Société Médico-Chirurgicale de l'Indochine.*]

the diagram, with 5 cc. of H_2SO_4. A few drops of 1/1,000 $KMnO_4$ are added until a rose colour appears, and then the solution is decolourized with H_2O_2. Next, some fragments of zinc (which have been activated by 10 minutes immersion in 10 cc. of water containing a drop of $CuSO_4$) are added. The stopper with the tube containing the sensitive paper, impregnated with mercuric chloride, is then inserted. After 3 hours, the sensitized paper is removed and immersed in a 10 per cent. solution of potassium iodide in order to fix the colour. The arsenic evolved produces a yellow colouration of the paper, which is turned brown by the potassium iodide. The more arsenic the water contains, the greater is the length of paper turned brown. When there are tenths of milligrams in a litre of water, about 5 cm. of the paper is coloured ; when there are hundredths, about 1 cm. ; when there are thousandths, only a few millimetres. Forty-eight hours after the application of 1 per cent. Paris green, none can be detected in the water by this reaction. This shows that there is no danger that applications repeated at the usual intervals can lead to a poisonous accumulation of arsenic.

W. F.

DE BENEDETTI (A.). Sulla permanenza del verde di Parigi alla superficie delle acque stagnanti delarvizzate col metodo de Benedetti. [**Permanence of Paris Green on Stagnant Water.**]—*Riv. di Malariologia.* 1934. Vol. 13. No. 2. pp. 211–216. English summary.

" From the author's experiments it results that Paris green mixed at the rate of 2 per cent. with earth prepared according to the author's method, persists on the surface of stagnant waters and shows larvicide power at least 24–25 days after the spreading. Then in the best environmental conditions and in the dry season, it will be sufficient to repeat the treatment about every 30 days.

" It is evident that the conditions change whenever rain falls or violent winds occur, or if there are running waters. A determination of the arsenic should be made by means of Gutzeit's reaction for establishing the necessity of repeating the antilarval spreading.

" From the economical and practical standpoints this method seems to present remarkable advantages." *W. F.*

SWELLENGREBEL (N. H.). 7 jaar ervaring over anopheles bestrijding in Medemblik. [**Seven Years of Anti-Mosquito Measures in Medemblik.**]—*Nederl. Tijdschr. v. Geneesk.* 1934. Jan. 20. Vol. 78. No. 3. pp. 345–353.

An extensive trial of Schweinfurth (Paris) green as a means of killing mosquito larvae has been made in Holland by the author. The results have not been satisfactory even by treatment of all breeding places inside a radius of 3 kilometres. Thus, when the cost of the procedure is considered and the relative unimportance of the disease, it does not seem wise to recommend it as advisable for a country like Holland, however suitable this antimalarial measure may be for other countries and other conditions. Methods of individual prophylaxis have been found much more satisfactory and the use of a pyrethrum preparation for killing mosquitoes, especially in stables, is highly recommended. Commercial preparations are effective but costly and there is little difficulty in making as good insecticides as " Sheltox " and " Flit."

W. F. Harvey.

NIJKAMP (J. A.) & SWELLENGREBEL (N. H.). Proeven over anophelesvernietiging met pyrethrumpraeparaten. [**Mosquito Extermination with Pyrethrum Preparations.**]—*Nederl. Tijdschr. v. Geneesk.* 1934. May 26. Vol. 78. No. 21. pp. 2327–2338. With 6 figs. on 2 plates. English summary.

An active campaign against mosquitoes is carried on in Holland as an approved anti-malarial measure. The mosquitoes are killed in stables and in houses and pyrethrum extracts have been found to be very efficient lethal agents. Stables were mostly used for the tests. The pyrethrum consisted of the ground flower heads of the type Dalmatian IA. Various extracting agents were tested such as petroleum ether, sulphuric ether, ethylene trichloride and carbon tetrachloride, and the order given is the order of efficiency. Stables and houses are treated by spraying through a fine atomizer under compressed air pressure of 1½ to 2 atmospheres and the mosquito is killed by the impact on it of a fine droplet. The final formula of the spray material arrived at was, petroleum (with much naphtha and high boiling point) 1,000; pyrethrum-extract 5; sassafras oil 5; methylsalicylate 20, and this costs 0·12 florins for spraying 100 cubic metres, a

price which is low in comparison with commercial preparations. For stables the amount of sassafras oil should be increased to 10 cc. Methyl-salicylate has no lethal effect on mosquitoes but serves to give the spray its fragrance. This insecticide makes no marks upon furniture, a very important matter when it is to be used within the house. Quantities to be used will vary, say from 2·5 to 4·8 cc. per cubic metre. Some extension of trials was made for other insects than mosquitoes. Flies (*Musca domestica*) required the addition of 10 instead of 5 gm. of pyrethrum extract per litre, bugs 25 gm. per litre and the use of at least 15 cc. per cubic metre, while fleas were not completely exterminated even with preliminary spraying of the floor by a 25 per thousand pyrethrum extract and the use of 10 cc. per cubic metre.

W. F. Harvey.

Ginsburg (J. M.). **Specifications for Mosquito Oils and Larvicides.**—*New Jersey Stas. Circ. 291.* 1933. 4 pp. [Summarized in *Experiment Station Rec.* 1934. June. Vol. 70. No. 6. pp. 810–811.]

"Experiments conducted have shown that fractions of petroleum boiling at from 200° to 550°F. are very toxic to mosquito larvae and pupae, giving a complete kill within 30 min. The higher boiling fractions possess lower toxicity, requiring several hours to kill, meanwhile allowing mature pupae to develop into adults. On the other hand, the low boiling fractions possess high volatility and rapidly evaporate from the surface of the water, whereas the high boiling fractions do not volatilize and only slowly decompose, leaving an oil film on the water for a long time, thus preventing oviposition and hatching of mosquito eggs. A mixture of these fractions in proper proportions produces an oil which is highly toxic to larvae and lasts for 8 days or longer. Such an oil can be readily prepared by mixing low grade kerosene or a similar cheap light fuel oil with various proportions of either heavy distillate fuel oil or crank-case waste oil. Application of the oil may be made with equipment varying from the ordinary hand sprayer to the airplane.

"It is pointed out that while petroleum oil is at present the most reliable larvicidal agent on both fresh and salt water, where it cannot be employed due to its poisoning fish and water-fowl and injury to aquatic plants a pyrethrum larvicide has been found satisfactory. This consists of kerosene extract of pyrethrum equal in strength to 20 lb. of pyrethrum flowers to the gallon and liquid coconut soap containing about 40 per cent. actual soap. In order to apply this larvicide on salt water, powdered skim milk or similar emulsifying agents which do not react with salt water, such as glue and various gums, should be used instead of soap."

Quaife (W. T.). **Further Remarks on the Brushing Method of Oiling.**—*Malayan Med. Jl.* 1934. Mar. Vol. 9. No. 1. pp. 38–39.

Brush-oiling is as efficient as spraying in *A. maculatus* areas, and requires only half as much oil.

The equipment required is a one or two gallon pail for the oil, a flat bamboo broom measuring eight or ten inches by five inches, and a small mop. The mop should be made of the hard outside part of coconut husk, bound with wire to a stick half an inch in diameter. The

free part of the husk should be 3 inches long, and 1 inch in diameter. " These dimensions are essential as the use of a larger mop for scattering the oil will lead to waste." One man and a boy are needed. The boy walks ahead and at every fourth pace he stops, dips the mop into the pail and scatters the oil on the water-surface in front and behind him. The brusher walks behind, moving up stream, and brushes the water forward at an acute angle to the bank. The man and boy usually walk in the stream. Springs and small seepages must be especially attended to by the mopper. It is absolutely necessary to keep the drain beds edges very clean and free from weeds. The author gives the following example of the economy of brushing : the cost of oiling on a 1,000 acre estate by the spraying method was $672 in a year, but with the brush method it was only $337. In the discussion which followed the paper, Dr. W. J. Vickers stated that the brush method was now in use throughout the Kuala Lumpur area, and had effected a saving in oil of 50 per cent. No larvae more than 4 days old had ever been found in the oiled area. Dr. C. H. Williams said that he had tried this method in an area where *A. ludlowi* was breeding, but it had not been a success. Possibly this mosquito is more resistant than *A. maculatus*.

W. F.

Scott (G. Waugh). **Fascine Drainage in Mosquito Control.**—*Malayan Med. Jl.* 1934. Mar. Vol. 9. No. 1. pp. 65–66. With 3 figs.

The method is as follows :—The drain is first cleaned out. A layer of round sticks is packed into the bottom of the drain until the normal water level is 6 inches below the topmost sticks. A layer of lallang (coarse native grass) is spread on the top sufficiently thick to prevent the access of mosquitoes to the water flowing through the sticks. The lallang thatch may be covered with a layer of earth. Such drains last about 6 months and are a cheap substitute for oiling. The method is suitable for drains, measuring 9 inches to 3 feet across. *W. F.*

Collignon (E.). De l'insuffisance des radiers plats pour la suppression définitive des gîtes à anophélines.—[**Inadequacy of Flat-bottomed Drains to prevent Mosquito Breeding.**]—*Arch. Inst. Pasteur d'Algérie.* 1934. Mar. Vol. 12. No. 1. pp. 26–28. With 3 figs.

A concrete drain which serves its purpose in draining the soil may yet provide breeding places for mosquitoes in Algeria during the dry season, when there is no more than a trickle of water flowing down it. Under these conditions green algae grow, and puddles are formed in the bottom of the drain. In order to avoid this, the drain should be provided with a small central gully, or lunette, towards which the bottom of the drain should be sloped. *W. F.*

Sicault (G.). Note sur l'adaptation du *Gambusia holbrooki* aux eaux salées. [**Adaptation of *Gambusia holbrooki* to Saline Water.**]—*Bull. Soc. Path. Exot.* 1934. May 9. Vol. 27. No. 5. pp. 485–488.

The author sought to know whether Gambusia could be used to keep down Anopheles in the saline water of the lagoons at the mouths of the Moroccan wadis.

From his experiments in his aquaria he concludes that Gambusia can be transferred at once to water containing 11 parts of sodium chloride per mille without diminution of its larvivorous capacity, and progressively to water of saline content of 33 parts per mille, exceeding that of sea water. Above 18 parts per mille the larvivorous activity lessens, at 36 parts it is nil and at this concentration the mortality is considerable. Indeed waters of salt concentration above 35 parts per mille is unsuited to Gambusia. Cazanove remarked that Le Moal has reported larvae of Anopheles in marshes at Dakar the salinity of which reached 24 parts per mille. *A. G. B.*

Legendre (F.). Introduction à Madagascar du *Gambusia holbrooki*. [**Introduction of Gambusia to Madagascar.**]—*Bull. Soc. Path. Exot.* 1934. Mar. 14. Vol. 27. No. 3. pp. 291–294. With 1 plate.

The author [not to be confused with his predecessor J. Legendre] obtained from Corsica some specimens of Gambusia, thirteen of which eventually reached Antananarivo. They were put into a small pool at the Pasteur Institute and were later transferred to other natural waters. There are now many millions of them. They are described with a plate which shows the difference in size of the sexes and the characteristic markings. They live in sweet or brackish water, running or stagnant, provided they find food enough. They eat more larvae when the water edges are kept free of vegetation. The females produce 50–60 young 6–7 times a year. Some hints are given how to transport them. *A. G. B.*

Paladino-Blandini (A.) & Marino-Assereto (P.). La chinoplasmina nella profilassi della malaria a Schiavonea (bonifica di Sibari). [**Quinoplasmine as a Prophylactic.**]—*Riv. di Malariologia.* 1934. Vol. 13. No. 2. pp. 161–173. With 4 figs. [12 refs.] French summary.

The authors administered a prophylactic dose once a week to an isolated population of 978 persons living at Schiavonea in Calabria. The weekly dose for adults was 0·02 grams of plasmoquine and 0·6 grams of quinine sulphate. No primary infections occurred during the malaria season, except in one infant. *W. F.*

Soesilo (R.) & Gilbert (A. Ph. W.). **Report about Malaria-Prophylaxis and -Treatment with Atebrin.**—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië.* 1934. Vol. 23. No. 1. pp. 5–7.

Twenty-one volunteers were given prophylactic atebrin, and 11 controls were given none. All were then bitten by infected mosquitoes. Ten of the eleven controls became infected, but only 6 of the 21 who had taken atebrin. The amount of atebrin was 0·1 or 0·2 grams given between 5 and 24 hours before the mosquitoes were applied and continued daily for 4 to 6 days afterwards. Seventeen volunteers infected with *P. falciparum* were treated with atebrin 0·1 gm., three times a day for 5 or 6 days. They were kept under observation for 12 to 17 months, and only 3 relapsed. (See above, p. 474.) *W. F.*

SWELLENGREBEL (N. H.). De splitsing der Anophelessoorten. [**The Subdivision of Anopheles Species.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1934. June 5. Vol. 74. No. 12. pp. 706–711.

This article is a vigorous reply to the accusation, evidently launched by the hygienist, that continued subdivision of the Anopheles into species, races and varieties as at present practised is so much entomological pedantry (aanstellerij, kleinkrämerei) and quite unnecessary.

Why is it necessary to make special investigation in Java and Sumatra into the anopheline fauna, when it is known to be very similar to that of Malacca, where all the dangerous malaria-carrying species are already known? The answer is supplied in considerable detail. In Malacca and British India *ludlowi* is of less importance than in the Netherlands Indies, while in the Philippines it is of still less importance. For Malacca *umbrosus* and *maculatus* are the vectors. In Semarang, on the other hand, this rôle belongs to *ludlowi* on the coast and to *aconitus* and *maculatus* in the hill country. What the condition of affairs may be in Tajoe is not known, nor is there any disgrace in confession of this want of knowledge. It simply emphasizes the fact that local investigation must precede the application of practical measures. To continue the illustration—*sinensis* of Sumatra is, in regard to malaria, " other than " *sinensis* in Java. This term " other than," as applied to the same species of Anopheles, is explainable as due to the occurrence of local races. Take *ludlowi* with its *sundaica* as an example. In the Netherlands Indies *ludlowi* is a carrier of malaria but not in the Philippines. " Sundaica," therefore, becomes the symbol of the conviction that certain morphological characteristics make it possible to decide whether a given *ludlowi* is a vector or not. Such a conclusion is confirmation of the fact that museum specimens and groupings are really the mirror of groupings in living nature and that these collections are to be ranked higher than collections of postage stamps.

Other factors also go to clinch this argument for the fixity and validity of the entomologist's species, races and varieties. A reference to the widely distributed *maculipennis* will illustrate this. One race of this mosquito is the short-wing or *atroparvus*; it is the carrier of malaria in Holland, because it remains a blood-sucker in autumn. The other race is the long-wing or *messeae*, which does not transmit malaria, because it does not suck the blood in the autumnal malaria season. The short-wing race breeds in brackish and in salt water, the long-wing only in fresh water. Malaria in the Netherlands is a brackish water product, a fact which was already known long before the era of plasmodia and anopheles.

The factor of interfertility is another important distinction for the establishment of true species, notably among butterflies. It has been found to apply to the mosquito races just considered. Short-wing *maculipennis* mates in cages and captivity but long-wing does not. Moreover, although the two races can be crossed in both directions, eggs may be laid, and even embryos develop, still none of the larvae are viable. Similar experimentation with another race of *maculipennis* called *typicus* and *atroparvus* showed production of hybrids but that the male hybrid produced no spermatozoa and the female no egg follicles. Thus the reply can be made to the critical hygienist that anopheles species and races are of definite importance in malaria practice and careful entomological analysis is not mere pedantry. *W. F. Harvey.*

ROUBAUD (E.) & TREILLARD (M.). Influence de la nourriture larvaire sur le développement et le comportement agressif des anophèles. Note préliminaire. [**Influence of Diet of Larvae on Development and Aggressive Behaviour of Anopheles.**]—*Bull. Soc. Path. Exot.* 1934. May 9. Vol. 27. No. 5. pp. 461–467.

The authors have fed larvae of *Anopheles maculipennis messeae* in different ways; they observe the effects upon the larvae and upon the adults which emerge from them.

The paper describes a number of experiments, nearly all of them carried out in duplicate: groups of larvae brought from the same batch of eggs were treated identically, except that some were fed on powdered spleen, others on powdered leaves, and others on mixed diets. The adults were put in small cages and offered blood in a standard way daily. The authors observed differences in the mortality and rate of growth of the larvae and in the size of larvae and adults; they also found that females from larvae fed on vegetable diet took blood earlier than others.

A number of possible explanations of these facts will occur to the reader. It is not, for instance, certain that the different types of food were all supplied in ample quantities: it follows that differences in growth or mortality might be due to partial starvation or to one food being really better than another. The authors' own explanation of some of the experiments is that those larvae which were fed on spleen stored up nitrogen, and thereby produced adults which were less avid for blood because they had less need for protein, from which to produce eggs. The view would gain support if it had been shown that larvae or pupae fed on spleen actually contained more protein than others, but much work of a solid biochemical nature must be done before we can accept or reject the interesting generalizations with which the paper concludes. *P. A. Buxton.*

DE MEILLON (Botha). **Entomological Studies—Observations on** *Anopheles funestus* **and** *Anopheles gambiae* **in the Transvaal.**—*Publications of South African Inst. Med. Res.* 1934. Feb. No. 32. pp. 199–248. With 4 maps, 7 graphs & 5 figs. [11 refs.]

Of the two malaria vectors mentioned in the title of the present contribution, both of which are very widely distributed in Africa south of the Tropic of Cancer, the former, in the Transvaal at any rate as already shown by the author (see this *Bulletin*, Vol. 30, p. 608), appears to be represented by two races, one of which frequents human dwellings and is found in endemic malarious areas, while the other shuns habitations and occurs where malaria is absent. While *A. funestus* breeds in permanent streams rising in the Drakensberg, *A. gambiae*, which is associated with malarial epidemics, prefers to oviposit in small temporary pools in river beds, and in backwaters. For the existence of the house-frequenting race of *A. funestus*, which is not met with above 2,500 feet, the requisite conditions are :—an annual rainfall of at least 30 inches; a mean temperature of 61°F. or more; and a range of temperature not exceeding 40°F. The eggs of *A. gambiae* are relatively more resistant to desiccation than are those of *A. funestus*, but larvae of the former species, if exposed to the sun on wet mud, soon perish. In selecting a breeding place, the gravid female of *A. gambiae* appears to be influenced to some extent by the food content of the water.

A meal of blood is a necessary preliminary to the development of the eggs in *A. funestus* which, having entered a human habitation on

hatching, only forsakes it when the eggs are ready to be laid. *A. gambiae*, on the other hand, after entering a dwelling in the evening, may leave early next morning and spend the day underneath stones or in crevices. Though a 5-candle power lamp will not exclude *A. funestus*, a light of 300-candle power was found to be an effective safeguard. While both sexes of *A. funestus* may travel so far as two miles from their hatching-place, eighty per cent. of the specimens remain within a radius of half-a-mile; in one instance, however, two females flew four and a half miles in order to feed. As a repellent against the attacks of *A. funestus* there is much to be said for citronella oil, which is so popular in South Africa; but it must be applied thoroughly, and at intervals not longer than five hours. *E. E. Austen.*

i. Stuart (G.). **The Anopheline Mosquitos of Palestine.**—*Jl. Egyptian Med. Assoc.* 1933. July. Vol. 16. No. 7. pp. 769–776.

ii. Reither (R.). **On the Autumnal Migration of *Anopheles elutus* in the Lake Huleh Territory.**—*Ibid.* pp. 777–782. With 2 figs.

i. The Palestine fauna includes nine species of Anopheles, but of these *A. mauritianus* and *A. pharoensis* are of rare occurrence and no practical importance. Of the remainder, *A. bifurcatus*, which in Palestine breeds almost exclusively, and practically throughout the year, in household wells, cisterns and other water receptacles, is the disseminator of urban malaria; while *A. elutus*, *A. superpictus*. *A. sergenti*, *A. algeriensis*, *A. multicolor* and *A. hyrcanus* are rural species. Among the latter group, *A. hyrcanus* and *A. algeriensis* are "wild" mosquitoes, which do not visit houses and are therefore negligible as vectors.

Although evidence from dissection is incomplete, on epidemiological grounds *A. multicolor*, a wide-ranging brackish water breeder, appears to have little to do with the spread of malaria. *A. sergenti* on the other hand, "the dominant mosquito throughout September and October," whose larvae are often found together with those of *A. superpictus* and *A. elutus*, is, like *A. superpictus*, an important vector. So efficient has been post-War malaria control in the towns and hill villages of Palestine, that the former dominance of *A. bifurcatus* in that country has been much modified; it remains to be seen whether, as originally suggested by Buxton, *A. elutus* will prove to be the chief vector of benign tertian malaria, with its peak in August, while *A. sergenti* is especially concerned in the conveyance of malignant malaria, the chief incidence of which occurs later on.

This paper, which includes useful notes on the distinctive larval characters, breeding places and seasonal occurrence in Palestine of the above-mentioned species, commences with a generous tribute to the pioneer work of others.

[Serious though the potential danger of malaria undoubtedly was to the Egyptian Expeditionary Force during the Palestine campaigns of 1917–18, the author's statement that the disease "ravaged and decimated the troops engaged on this front" is scarcely in accordance with facts, at least for the period before the general advance on September 19th, 1918. Whether or not as the result of very extensive anti-mosquito measures, "for the six months prior to October, 1918, the percentage incidence of malaria for the three Corps of which our front line was composed was just over five. To this, the sudden rise in the malarial rate within three weeks after the date of the general advance affords a sharp and significant contrast." (See Austen, *Trans. Soc. Trop. Med. & Hyg.* 1919, November, Vol. 13, pp. 47–59).]

ii. In spring, the sporadic appearance of *A. elutus* in hill villages 5 to 7½ miles south-west of Lake Huleh, in Upper Galilee, is due to the presence of small breeding places in the vicinity. At the beginning of summer these dry up completely, and the adult mosquitoes entirely disappear from the area. In autumn (November), as was first mentioned by Kligler (see this *Bulletin*, Vol. 26, p. 6), before the winter rains set in or any new breeding places are formed, the hibernating generation of *A. elutus*, bred in the swamps of Lake Huleh and characterized by undeveloped ovaries and an abdominal cavity filled with fat-body, migrates *en masse* to a distance of some 8 miles (12½ km.), which far exceeds the usual length of flight of the spring and summer generations. This migration, which proceeds from the breeding place in all directions, and is therefore not mere carriage by wind, causes the spread of malaria in areas at other times largely free from the disease.

E. E. A.

i. Mesnard (J.) & Toumanoff (C.). Note préliminaire sur l'antropophilie de *A. minimus* Théo. avec quelques remarques sur la zoophilie de *A. vagus* Don. en absence de stabulation parfaite du bétail. [**On the Androphily of *A. minimus*, with Remarks on the Zoophily of *A. vagus* in Default of Complete Stalling of Stock.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1933. Nov.–Dec. Vol. 11. No. 8. pp. 994–1000. With 3 figs.

ii. Toumanoff (C.). Sur la fréquentation des habitations et des étables par les anophèles du Tonkin et la proportion des sexes dans les captures et les élevages. [**The Frequenting of Dwellings and Cattle-Sheds by Tonking Anopheles, and the Proportion of the Sexes Caught and Bred.**]—*Ibid.* pp. 1001–1017. [10 refs.]

i. The application of the precipitin test to *A. minimus* from a highly malarious locality in Cochin China showed that 86·48 of the specimens were gorged with human blood ; in no case had the insects been feeding on buffaloes or horses, although these animals were present. Thus results obtained by aid of precipitins tally with the presumption as to the food of the species in question derived from its maxillary index. *A. vagus* on the other hand, which is common in the Mekong delta, frequently battens on buffalo blood ; and, since the local cattle-sheds are merely open shelters, there is no impediment to the attraction of stock for this species, as well as for *A. hyrcanus* var. *sinensis*. In a native village surrounded by such sheds, the huts merely form retreats for a species locally characterized by marked zoophily ; and the institution of perfect stalling, as advised by Roubaud, would probably result in a complete severance of relations between *A. vagus* and man.

ii. The studies here described were initiated with the aim of discovering whether, in Tonking, the species of Anopheles found respectively in dwellings and in cattle-sheds are in accordance with the food-preferences of the insects ; and whether there is agreement between such occurrence and capacity or otherwise to transmit malaria. Out of twelve species met with in the adult stage in each type of shelter, the commonest in human habitations were, in order of frequency, *A. vagus*, *A. minimus*, and *A. hyrcanus* var. *sinensis* ; in cattle-sheds, although the same three species were the most numerous, the order was somewhat different, being *A. hyrcanus* var. *sinensis*, *A. vagus*, *A. minimus*. During the winter monsoon, *i.e.*, at the time of its maximum abundance, the latter species is the principal one found in dwellings ; while

during the summer monsoon it is relatively scarce in both types of shelter. Otherwise, apart from *A. hyrcanus* var. *sinensis*, the occurrence of species was not found to be in accordance with their transmitting power; and *A. jeyporiensis* and *A. aconitus*, both of which are recognized malarial vectors, were encountered in cattle-sheds as much as in human habitations. In studying predilection or the opposite for one or other type of shelter, it is necessary in each case to take account not only of the season, but also of other factors; and androphily or zoophily can be determined only by means of ROUBAUD's maxillary index (see this *Bulletin*, Vol. 30, p. 610), or by aid of the precipitin test (see above).

Females were found to predominate in both types of shelter; yet the scarcity of males revealed by captured specimens is merely apparent, and caution is necessary in estimating the proportion of the sexes. In adults reared from wild-caught larvae, and also from eggs laid in captivity, males and females were approximately equal in number, though the latter were very slightly in excess. *E. E. A.*

MORIN (H. G. S.) & BADER (H.). Sur quelques facteurs physico-chimiques de l'oecologie larvaire des anophèles au Tonkin. (Deuxième note.) [**Physico-Chemical Factors in the Larval Ecology of Tonking Anopheles.**]—*Ann. Inst. Pasteur.* 1934. Mar. Vol. 52. No. 3. pp. 332–351. With 3 graphs & 1 fig.

The first part of this paper consists of records of experiments designed to show the amount of carbonic acid liberated by samples of different kinds of earth in Tonking, when treated with distilled water. From these experiments it is seen that organisms living either in water or on the surface of damp soil are in contact with proportions of carbonic acid gas, which vary greatly according to circumstances probably seasonal and perhaps even depending upon the particular year. Thus, if the authors' findings be confirmed, the effect of meteorological conditions upon living creatures would in many cases be explained by the natural production of carbonic acid gas owing to the action of water on the soil; and not only would the frequent connexion between rainfall or floods and the outbreak of epidemics become intelligible, but we might obtain useful information with regard to remedial measures.

Subsequently many pages are devoted to the hydraulics of the penetration of water through clay, in order to explain how it is that, in the Red River delta in Tonking, apparently stagnant pools are fed intermittently and seasonally by water, passing upwards from deeper levels through a homogeneous bed of clay, and thus come to be endowed with the usual characteristics of larval habitats of *A. minimus*. *E. E. A.*

i. ROUBAUD (E.) & TREILLARD (M.). L'indice maxillaire chez *Pseudomyzomyia ludlowi* (var. *sundaïca* et var. *litoralis*) en Indochine méridionale. [**The Maxillary Index in *Anopheles ludlowi* vars. *sundaicus* and *litoralis*), in Southern Indo-China.**]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6 pp. 552–554.

ii. TREILLARD (M.). *Pseudomyzomyia ludlowi* en Indochine méridionale: variétés, biologie et pouvoir pathogène. [*A. ludlowi* **in Southern Indo-China: its Varieties, Biology and Disease-carrying Powers.**]—*Ibid.* pp. 554–559. With 2 figs.

i. No data are as yet available regarding the maxillary index of *A. ludlowi*, which plays a great part in the transmission of malaria in

Malaya, the Dutch East Indies, the Andaman Is., and on the south coast of Cambodia and Siam, and is one of the most important vectors of the disease throughout the Far East. In Southern Indo-China it occurs sporadically in the delta of Cochin China, and, in strictly androphilous and domestic conditions, in several localities on the shore of the Gulf of Siam, where it abounds in human habitations and shows a high percentage of infection.

The typical *A. ludlowi*, however, as also the variety *litoralis*, both of which are found in the Philippine Is., do not appear to be malaria carriers, while on the other hand the var. *sundaicus* [*A. sundaicus* of English writers] is a vector of importance. The two varieties mentioned occur in Indo-China, and *litoralis* is conspicuous among the scanty representatives of the species in regions, such as the delta of Cochin China, which are but slightly malarious. On the other hand in a malarious centre such as Réam in Western Cambodia the var. *sundaicus* predominates, and infected individuals belong to this form.

The mean maxillary indices of the vars. *sundaicus* and *litoralis* as exhibited by specimens from different localities on the coast of Cambodia and in the delta of Cochin China, are respectively 11·5 and 12·5, the maximum numbers of denticles observed being 12 (var. *sundaicus*) and 14 (var. *litoralis*), and the corresponding minima 10 and 11. Statistics are also given showing the proportion of maximal figures; the proportion of individuals having an index higher than 11·5; and the most frequent index. Although the two varieties examined do not exhibit marked differences in their maxillary dentition, *sundaicus*, the more pathogenic of the two, is the more nearly allied to the paucidentate group including *Anopheles minimus*, *A. aconitus* and *A. jeyporiensis*, the other important vectors in Indo-China, all of which have an index somewhere about 11·5.

Should subsequent study confirm these results, we shall have a fresh example of the parallelism existing between paucidentition and the domestic androphilism of the pathogenic species, showing within one and the same anopheline group a differentiation in respect of feeding preferences and therefore of pathogenic power.

ii. Figures are given showing the wing markings in the group of species (*A. ludlowi* and its above-mentioned varieties *litoralis* and *sundaicus*; *A. paragensis*; *A. subpictus*; and *A. vagus*) resulting from the splitting up of what was formerly known as *Anopheles rossii*.

Individual longevity in *A. ludlowi* var. *sundaicus* is very pronounced. Whereas in the laboratory *A. vagus* seldom lives for 15 days, var. *sundaicus* in the same conditions may survive for 70, which suggests its ability to bite repeatedly.

A. ludlowi is especially abundant during the dry season in Southern Indo-China, whereas *A. vagus* reaches its peak during the rains. This periodicity is therefore not solely due to the production of breeding places in the wet season, but is largely connected with the hygrometric requirements of the adults.

While *A. minimus* owing to the nature of its breeding places is difficult to attack in the larval stage, measures against *A. ludlowi* var. *sundaicus*, which have proved so successful in the Andaman Is. and the Dutch East Indies, are facilitated, not only by the domestication of the adults, but by the localization of the larvae. *E. E. A.*

Russell (Paul F.) & Santiago (Domingo). **Flight Range of the *Funestus-minimus* Subgroup of Anopheles in the Philippines. First Experiment with Stained Mosquitoes.**—*Amer. Jl. Trop. Med.* 1934. Mar. Vol. 14. No. 2. pp. 139–157. With 2 figs. & 1 map. [35 refs.]

The range of flight of the various malarial mosquitoes, though a matter of obvious practical importance, has in most cases not yet been definitely determined, and is still to some extent a matter of opinion; observers in the Argentine and in Java, however, working with stained anophelines, have recorded maximum distances of 6 kilometres (3¾ miles) and 6·2 kilometres respectively. In the Philippines, the so-called *Anopheles funestus-minimus* subgroup, which is believed to include the chief local vectors of malaria, is composed of *A. filipinae*, *A. mangyanus* and *A. minimus* var. *flavirostris*, all of which breed in streams in the malarious foothills. In the experiment described 2,100 mosquitoes, "reared from larvae caught in typical *funestus-minimus* subgroup breeding places near Calauan," were "sprayed with a 2 per cent. aqueous solution of brilliant blue" (previously proved to be innocuous to the insects), and liberated two hours later. During the following twelve days, among a total of 10,946 mosquitoes caught at various points north and south of the place of release, 8 stained specimens were recovered; these included *A. minimus* var. *flavirostris* captured at 0·5 kilometre (550 yards); *A. mangyanus* at 0·9 kilometre; and *A. filipinae* at 1 kilometre from the spot where they were set free.

A further experiment, using larger numbers of mosquitoes, is to be undertaken. *E. E. A.*

Roubaud (E.) & Colas-Belcour (J.). Observations sur la biologie de l'*Anopheles plumbeus*. III.—Le chevauchement des générations dans le cycle hibernal. [**Biology of *A. plumbeus*. III. The Overlapping of Generations in the Winter Cycle.**]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6. pp. 546–551. With 1 fig.

As already shown (this *Bulletin*, Vol. 29, p. 835, and *ante*, p. 58), larvae from eggs deposited by *A. plumbeus* at the end of the season are destined to pass through the winter, and are subject to spontaneous developmental torpor (asthenobiosis), which is not dependent upon outside influences. Their development is from eight to ten times slower than that of the larvae of the spring generation. Torpid larvae, however, occur not only during autumn and winter; their appearance is due to senescence, both of actual generations according to the position of these in the annual series, and also of individual parents in a given generation, and in each case it is the result of fatigue. Thus larvae affected by asthenobiosis may appear in the first broods of the year, and they increase in number with the seasonal advance in the life-cycle of the species.

The author concludes from his observations that in *A. plumbeus* delayed larval development may in part be due to senescence of the mother, and may manifest itself in the first annual generation, members of which will consequently largely overlap those of the later broods of the year. Larvae from eggs deposited in July, by young females of the second post-hibernal generation, also included a proportion of individuals showing more or less retarded development; and in the case of one batch, which was kept at out-door temperature and passed through several periods of frost, the last pupa took 322 *days* to make its

appearance. With few exceptions, retarded development in the progeny of the second generation manifested itself in the female sex. On the other hand, batches of eggs laid by females caught in the open in August and September always produced larvae all of which showed delayed development, passed through the winter, and developed into adults of both sexes.

Thus, as one annual brood succeeds another, the proportion of individuals showing retarded development increases, until at the end of the season it includes the entire progeny. At this time, though larvae affected by asthenobiosis and obliged to pass through the winter may belong to at least three generations, the maintenance of the species from one year to the next devolves almost entirely upon the third of these. *E. E. A.*

Mehta (Dev Raj). **Ratio of Sexes of Some Indian Anophelines hatching under Controlled Conditions in the Laboratory.**—*Records of the Malaria Survey of India.* 1934. Mar. Vol. 4. No. 1. pp. 65–75. With 11 charts. [16 refs.]

Evidence in literature as to the proportion of the sexes in mosquitoes is conflicting; according to some writers males and females emerge from the pupa in more or less equal numbers, while others report marked predominance of one or other sex. In order to test these statements, especially with reference to the possible influence of different food conditions in the larval stage, the author (at Karnal, Punjab) made experiments with the three common Indian species, *Anopheles subpictus*, *A. annularis* and *A. culicifacies*, rearing the larvae in Petri dishes (1 inch by 6½ inches), each supplied with 200 cc. of distilled water, and feeding them either on dried and pulverised Spirogyra, pure yeast or crushed house-flies.

When different sized batches of larvae of *A. subpictus* were reared on Spirogyra, the sexes hatched out in approximately equal numbers, though in three out of four experiments females were in excess; the quantity of food supplied did not affect the sex-ratio, and neither sex appeared sooner than the other. Females (58 females to 36 males in one case, and 221 females to 188 males in the other) preponderated as the result of two experiments with larvae of *A. annularis*, powdered yeast being the food; in one case distilled water was replaced by water from a natural breeding place, containing fresh Spirogyra filaments. When newly hatched larvae of *A. subpictus* were fed on macerated flies, adults of both sexes subsequently emerged together "in almost equal numbers."

In order to check the foregoing results, large numbers of larvae of all three species mentioned, obtained in natural breeding places, were reared to the adult stage in the laboratory. Out of 3,325 *A. annularis* bred out in this way from March to June, 1933, 1,857 were males and 1,468 females, and emergences of the former sex were greatly in the majority during the first two months. Again, out of 1,807 bred specimens of *A. culicifacies*, the respective numbers of males and females were 947 and 860, and the preponderance of the former was especially noticeable at the beginning of the season. On the other hand in the case of *A. subpictus* the proportions of the sexes were reversed, and out of 3,007 bred adults 1,633 were females and only 1,374 males; the disparity was especially marked in the later emergences.

In the author's view, differentiation into sexes takes place in the ovum, so that "external factors during metamorphosis" can scarcely produce any inequality in this respect. *E. E. A.*

Senevet (G.). Contribution à l'étude des nymphes d'anophélinés. (4e mémoire.) [**On Anopheline Pupae (4th Contribution).**]—*Arch. Inst. Pasteur d'Algérie.* 1934. Mar. Vol. 12. No. 1. pp. 29–76. With 13 figs.

The chief incentive to the production of this useful paper was furnished by the pupal skins of ten species, including one of *Chagasia* and nine of *Anopheles*, recently received from the Panama Canal Zone by the London School of Hygiene and Tropical Medicine, and handed over to the author for study. Descriptions and illustrations of these, and also of the pupal skin of the South African *Anopheles ardensis*, are followed by a statement of the general characters exhibited by the pupa in the various anopheline groups, supplemented by keys to genera, sub-genera, groups and species, likewise based on pupal characters. Comparison of a score of pupal skins of *Anopheles barbumbrosus* with the same number belonging to *A. barbirostris* failed to reveal any points of difference.

An alphabetical list of the species of anophelines of which the pupa has been described concludes what is certainly not the least valuable of the memoirs published by the Institut Pasteur d'Algérie. *E. E. A.*

Galliard (H.) & Sautet (J.). Note préliminaire sur les races d'*Anopheles maculipennis* de Corse. [**Preliminary Note on the Races of *Anopheles maculipennis* in Corsica.**]—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No. 1. pp. 30–34.

In Corsica there are malarial belts in the coastal plain, and in the mountainous region tracts free from the disease. Results obtained by other workers elsewhere tend to show that the existence of malaria in western Europe is dependent upon the presence of the race or variety of *A. maculipennis* termed *atroparvus* or *labranchiae*, the larvae of which are said to live in brackish water. In Corsica, however, so far as may be judged from a study of 400 larvae from different points in the island, no such restriction as regards breeding place appears to occur. On the basis of larval and adult (hypopygial) characters, the great majority of Corsican specimens examined by the author belonged to the *labranchiae* (*atroparvus*) race. But, in addition to the long-winged race *messeae*, another (var. *maculipennis ?*), intermediate in size and as regards the maxillary index, was also met with. *E. E. A.*

i. van Thiel (P. H.). Recherches sur la présence de l'*Anopheles maculipennis* var. *labranchiae* dans les Pays-Bas. [**Occurrence in the Netherlands of *A. maculipennis* var. *labranchiae*.**]—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol. 27. No. 2. pp. 149–154.

ii. ——. Insuffisance des caractères de l'oeuf pour la distinction des races trophiques et biologiques de l'*Anopheles maculipennis* ? [**Insufficiency of the Egg-Characters for the Distinction of the Trophic and Biologic Races of *A. maculipennis* ?**]—*Ibid.* pp. 154–158.

i. Previous investigations by him in Italy convinced the author that *A. maculipennis* var. *labranchiae*, as found in central and southern Italy and Sardinia, while in the adult stage indistinguishable from the var. *atroparvus* of northern Italy, nevertheless shows a difference in the egg-floats, which are striated in *labranchiae* but transparent and smooth in *atroparvus*. The studies now described were undertaken in order to discover whether the persistence of malaria in certain parts of

the Netherlands is aided by the presence, among *A. maculipennis* var. *atroparvus*, of a sprinkling of the var. *labranchiae*, which is regarded as the more dangerous in southern Italy. For a number of years malaria has been fairly rife at Franeker, a small town in Friesland. But although, in houses and pigsties at this place, the author found Anopheles possibly belonging to the var. *labranchiae*, such insects cannot be of special importance in the epidemiology of malaria, since similar ones are almost equally common at two other Dutch localities, where malaria is much less frequent. Instead, therefore, of assigning these mosquitoes to var. *labranchiae*, van Thiel prefers to regard them as belonging to the short-winged *atroparvus* race, in which the striation of the egg-floats is much more variable than in *labranchiae*.

Since *Anopheles* containing nearly ripe eggs are rarely caught in houses, it is concluded that the females do not remain long indoors ; and that therefore malaria is seldom transmitted from one member of a family to another.

ii. This is by way of a reply to, or at least a commentary on a previous paper by Roubaud and Gaschen (see this *Bulletin*, Vol. 30, p. 611) with the same title, minus the note of interrogation. It would be useful, says the author, to examined the structure of the egg-floats in the *messeae* type of *A. maculipennis* in different countries. He thinks that the southern European form of this race could be differentiated from the macropterous Dutch race, in the same manner and to the same extent as distinction between the varieties *labranchiae* and *atroparvus* is possible (see above). Since the presence of one race seems better able than that of another to produce anophelism without malaria, it may be that egg-characters are of greater value than has hitherto been believed. Details are given of a breeding experiment showing that, in Holland, the second generation of var. *atroparvus* can pass through the winter, and give rise to the spring brood of the following year. The findings of Swellengrebel and his collaborators, and of Roubaud, on the subject of stenogamy and eurygamy are confirmed.

In a postscript, Roubaud confesses his inability to accept racial differences based on striation of the egg-floats, since, as admitted by van Thiel himself, all gradations are found between well marked striation and none at all. While denying that there is any reliable morphological difference between eggs of the *atroparvus* and *labranchiae* types, Roubaud reaffirms the validity, as distinctive characters between the two races, of definite biological differences, in addition to the fundamental criterion afforded by the maxillary index (see this *Bulletin*, *loc. cit.*). Egg-characters on the other hand enable us to distinguish with certainty between the two primary groups, *maculipennis-messeae* and *labranchiae-atroparvus*, although within each of these we find, according to locality, an infinite number of small differences, the value of which can be tested only by means of biological study. *E. E. A.*

Evans (A. M.). **On the Differentiation of *Anopheles maculipennis* in Great Britain, with Special Reference to a Form occurring on the Coast of North Wales.**—*Ann. Trop. Med. & Parasit.* 1934. Mar. 29. Vol. 28. No. 1. pp. 131–140. With 2 figs. [34 refs.]

Ten years ago Wright drew attention to differences between the hibernation habits of *A. maculipennis*, as observed by him in a coastal district of North Carnarvonshire, and the corresponding behaviour of the same species as recorded on the Continent. From observations on

the spot, and subsequent morphological study in the laboratory, Evans finds that WRIGHT'S *A. maculipennis*, while exhibiting certain differences, presents many points of similarity to the var. *atroparvus*, which is nowadays considered to be responsible for the local persistence of malaria in parts of Holland and Northern Germany. Previous observations on the bionomics of *A. maculipennis* in various British localities are summarized, and attention is drawn to indications of racial differentiation.

[Although at present so attractive to continental malariologists, the question of races or varieties of this species, in relation to the phenomenon of " anophelism without malaria," has not hitherto been the subject of definite research in England. The present contribution, inconclusive though it be, is therefore to be welcomed, especially should it, as is to be hoped, form an incentive to similar investigations in the formerly malarious, coastal districts of the eastern and south-eastern counties.] *E. E. A.*

ROUBAUD (E.). Etude du comportement sexuel comme caractère génétique chez l'*Anopheles maculipennis* (2e note). [**Study of Sexual Behaviour as a Genetic Character in** *Anopheles maculipennis* **(Second Note).**]—*Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 339–341. [3 refs.]

In a previous paper on this subject by Roubaud, in collaboration with COLAS-BELCOUR and GASCHEN (see this *Bulletin*, Vol. 30, pp. 305–306), it was shown that the eurygamous females of the macropterous Dutch race (*A. maculipennus* var. *messeae*) can be crossed with the stenogamous males of the var. *atroparvus* ; and that in the first mixed generation thus produced eurygamy proves to be a recessive character. The results of analogous experiments with the eurygamous var. *labranchiae* and the stenogamous var. *atroparvus* are now reported. The stock of the former variety, which is paucidentate, indifferently zoophilous, and breeds with great difficulty in a small space, was received from Spain (Murcia). In laboratory experiments carried on for two years in a cage one-twentieth of a cubic metre in size, several hundred females which were mated with their own males produced only two fertile batches of eggs. The *atroparvus* stock, on the other hand, obtained from the coastal marshes of Vendée, is definitely stenogamous, breeding freely in a cage of the dimensions stated. In June, 1933, in two cages (A and B) of this size, there were placed respectively 10 Murcian *labranchiae* females with fifteen Vendéean *atroparvus* males, and 10 Vendéean *atroparvus* females with fifteen Murcian *labranchiae* males. As a result, three batches of fertile eggs were deposited on 29th June and 6th July in cage B. By microscopical examination on the latter date, three out of six surviving females in cage A, and four out of seven in the other were found to have been fertilized.

From the fertile eggs in cage B adult males and females of the first cross generation were reared, but, in a cage measuring one-twentieth of a cubic metre, did not breed. It would seem then, although experiments are not yet complete, that, contrary to what occurs in the race *messeae* (*maculipennis typicus* of VAN THIEL), in the race *labranchiae*, after being crossed with *atroparvus*, eurygamy appears as a Mendelian *dominant* character.

Yet the most striking fact is that the sexes of the eurygamous *labranchiae* stock, which will not mate together in a confined space,

appear in the same conditions perfectly capable of fertilization when crossed with partners of a different race. The two races in question thus furnish a singular confirmation of the identical results obtained by De Buck, Schoute and Swellengrebel (this *Bulletin*, Vol. 30, pp. 70–71) in their experiments in crossing the two Dutch races of *A. maculipennis*. Corradetti (1934), in regarding male *labranchiae* as alone incapable of breeding in a confined space, is in error. *E. E. A.*

Corradetti (Augusto). Ricerche sulla biologia delle diverse razze di *Anopheles maculipennis*. [**Researches on the Biology of the Races of** *A. maculipennis*.]—*Riv. di Malariologia*. 1934. Vol. 13. No. 2. pp. 182–190. [12 refs.] English summary.

——. Sul comportamento sessuale dell'*Anopheles maculipennis* var. *labranchiae*.—*Ibid.* pp. 191–194. English summary (5 lines).

——. Ricerche sperimentali sui caratteri distintivi dell'*Anopheles elutus*.—*Ibid.* pp. 195–200. [18 refs.] English summary (8 lines).

The author found that the duration of the larval stage of all the races (*labranchiae, typicus, messeae, atroparvus, elutus*) was 19–22 days at 23°C., and that *messeae* did not complete its development in 10 per mille salt water, whereas *labranchiae* and *atroparvus* did. Fertilization in captivity was obtained with *atroparvus*, and cross-fertilization with female *labranchiae* and male *atroparvus*; the eggs had the characters of *labranchiae* and larvae resulted. *Maculipennis* and *elutus* cannot be differentiated by the general colour of the body. *A. G. B.*

Christophers (Rickard). **Malaria from a Zoological Point of View.**—*Proc. Roy. Soc. Med.* 1934. June. Vol. 27. No. 8. pp. 991–1000 (Sect. Comparative Med. pp. 41–50). [22 refs.]

It appears certain that distinct parasites occur respectively in the monkeys of the Oriental and the Ethiopean regions. *P. brasilianum* occurring in the Neotropical monkeys differs from any Old World form. None of the monkey parasites are really very close to those of man, but it is otherwise with those of the apes. The plasmodia of the gorilla and chimpanzee appear to be very similar to those of man, including the characteristic crescent forms. The parasites of human malaria do not show any apparent relationship to the usual zoogeographical realms. *P. vivax* occurs almost throughout the world within the July and January isotherms of 60°F. *P. falciparum* is limited by the isotherms of 70°F. *P. malariae* also probably has its distribution determined by factors other than those usually concerned in the distribution of animal forms of life. So far, *P. tenue* has been recorded from India only, and *P. ovale* from Africa. In a footnote, the author states that he twice injected a monkey (*S. rhesus*) with human blood containing *P. ovale*, but with negative results. This parasite resembles P. *knowlesi*, the monkey parasite. *W. F.*

Annals of Tropical Medicine & Parasitology. 1934. Mar. 29. Vol. 28. No. 1. pp. 63–65.—Malaria Research and the Malaria Commission of the League of Nations. (From Dr. E. J. Pampana, Acting Secretary to the Malaria Commission.)

Barbosa (Amando). Contribución al tratamiento del paludismo con la atebrina. —*Medicina Países Cálidos.* Madrid. 1934. Feb., Mar. & Apr. Vol. 7. Nos. 2, 3 & 4. pp. 73–81 ; 123–135 ; 157–173. [26 refs.]

Bellincioni (Giovanni). Studio sulle relazioni tra piogge e malaria.—*Riv. di Malariologia.* 1934. Vol. 13. No. 2. pp. 201–210. With 5 figs. French summary (7 lines).

Beregoff (Pauline). The Schilling Differential Blood Count in Tropical Diseases. A Study of 710 Cases with Special Reference to Malaria.—*Jl. Lab. & Clin. Med.* 1934. Mar. Vol. 19. No. 6. pp. 644–649. [10 refs.]

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Corongotó (Visnudas Sinai). Um rápido inquérito a algumas aldeias do Concelho de Quepém com sugestões para o seu saneamento sob o ponto de vista da malária.—*Arquivos da Escola Méd.-Cirurg. de Nova Goa.* Ser. B. 1934. No. 5. pp. 1285–1302.

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MISCELLANEOUS.

FEDERATED MALAY STATES. **Annual Report of the Institute for Medical Research for the Year 1932** [KINGSBURY (A. Neave), Director.]—108 pp. 1933. Kuala Lumpur: Govt. Press.

The chief items of interest in this report concern research in malaria and tropical typhus, and a case of human trypanosomiasis due to infection with *T. lewisi*.

Malaria.—Several experiments were made with quinoplasmoquine in the prophylaxis of malaria, and, as usual, the results depended upon the thoroughness of the supervision and discipline which could be exercised in the administration of the drug; for example, it was found in a group giving unsatisfactory results that only one person in every four was taking the tablets which had been provided. The administration of two tablets three times a week and one on Saturdays, for a period of nine months, reduced the parasite rate of the labourers on a rubber estate from 11·4 to 4·7 per cent., but it was found impracticable to treat the children under 3 years of age, and the cost was at the annual rate of $11·00 (£1 5s. 8d.) per coolie. A tablet of quinoplasmoquine contains 4½ grains of quinine and 0·01 gram. plasmoquine.

Dr. Richard GREEN made several comparative tests of atebrin and quinine in the treatment of malaria. He treated 125 cases in hospital with atebrin, and a second series of 125 with quinine. The majority of these patients were kept under observation for several weeks or months, and while the relapse rate in the quinine group was 35 per cent., the rate in the atebrin group was only 2 per cent. He also made comparative tests of the value of these drugs in the prophylaxis and treatment of malaria on rubber estates; here again the advantage was with atebrin and it cost less than the quinine used in the control group.

Dr. J. W. FIELD made a clinical trial of totaquina, Type 2, at the District Hospital in Kuala Lumpur. A first series was given 20 grains daily, and a second series, 2 grams per 100 lbs. of body weight (0·044 grams per kilo.) which is equal to 30 grains a day for a man weighing 7 stone 2 lbs. Equal numbers of controls were treated with quinine in the same doses. Thick blood films were examined daily, and parasite counts were made by Sinton's fowl corpuscle method. This work is still in progress, but from the results so far obtained it appears that there are no significant differences between totaquina and quinine either as regards therapeutic efficiency or toxicity, though parasites tend to disappear rather earlier with quinine.

Dr. Field also tested the efficacy of blood culture in the diagnosis in malaria, as recommended by KNOWLES. He concluded that it had no advantage over the ordinary thick film method of examination in benign tertian and quartan malaria, but, in subtertian, the recognition of parasites became easier after 24 hours' incubation, because the rings had grown to the pigmented schizont stage: later on, the number of parasites was reduced by phagocytosis. THOMSON's clumping was seen in many cases. It was limited to well grown schizonts, and was not a constant feature; for example, it was absent in a comatose case of cerebral malaria. Mayer's reagent does not always precipitate quinine from a urine which is alkaline, and Dr. Field therefore prefers Tanret's reagent which contains acetic acid. [*Ante*, p. 431.]

Dr. Richard GREEN and Mr. E. P. HODGKIN, the Entomologist, dissected a large number of anopheles caught in traps. Nineteen *A.*

maculatus were found with oöcysts and 45 with sporozoites; no infections, beyond a solitary gut infection in *A. karwari*, were found in other mosquitoes, though some of them—especially *A. karwari*—were more readily infected in the laboratory than *A. maculatus* itself. This apparent anomaly was explained by the results of precipitin tests carried out on mosquitoes, which showed that *A. karwari* and the other anopheles preferred to feed on animals and therefore did not carry malaria like the man-biting *A. maculatus*. A number of experiments was carried out with different samples of antimalaria oils and a mixture of 42 parts of heavy oil No. 2 with 22 parts of solar oil No. 3 appeared to be the most effective.

Tropical Typhus.—Dr. R. Lewthwaite and Dr. S. R. Savoor continued their work on the typhus fevers. [It will be remembered that there are three of these diseases in Malaya. (1) The urban or "W" form of tropical typhus, also known as "shop" typhus; in which *Proteus* X 19 is agglutinated. (2) The rural or "K" form, also known as "scrub" typhus, in which *Proteus* XK is agglutinated. (3) tsutsugamushi disease, or Japanese river fever, which occurs in the same places as scrub typhus, and in which, also, *Proteus* XK is agglutinated.] Shop typhus was readily established in guineapigs by the inoculation of the blood of a patient, and the strain (Manikam) is now in its 17th passage. Scrotal swelling usually occurs in guineapigs inoculated intraperitoneally with this strain and Rickettsia is present in the exudate. When the virus is inoculated into rabbits, it produces X19 agglutinins. The establishment of a strain of scrub typhus was a different matter, and it was only after numerous unsuccessful attempts that eventually a strain (Seerangayee) was established by the inoculation of a patient's blood into guineapigs which had been fed on a diet deficient in vitamins; this strain is now in its 34th passage. Scrotal swelling does not occur in guineapigs inoculated with this strain but Rickettsia is found in the scanty exudate over the spleen and testes. Inoculation of the virus into rabbits produces XK agglutinins. The virus of the tsutsugamushi disease is, like that of scrub typhus, difficult to establish in guineapigs and all attempts have been unsuccessful. The immunity reactions of the viruses of shop typhus and scrub typhus have been investigated. Each produces a solid immunity in guineapigs, but a guineapig which had been rendered immune to shop typhus is not immune to scrub typhus, nor is one which has been rendered immune to scrub typhus made immune to shop typhus. In short, there is no cross immunity between shop typhus and scrub typhus.

Nagayo has described a characteristic inflammatory reaction which follows the inoculation of the virus of the tsutsugamushi disease of Japan into the anterior chamber of rabbits' eyes. Lewthwaite and Savoor have used this method in the investigation of the Malayan diseases. Strains of the scrub form of tropical typhus and a strain of tsutsugamushi were readily established in rabbits and were passaged by the inoculation of aqueous humour. The reactions were the same as those described by Nagayo, and Rickettsia resembling his *Rickettsia orientalis* was constantly present on Descemet's membrane. The infection following the inoculation of virus into the eye is not merely local, for the rabbit subsequently gives a positive Weil-Felix reaction and the eye on the opposite side becomes immune to inoculation with the virus. The virus of shop typhus, the urban form of tropical typhus, which is easy to establish in guineapigs, could not be established in rabbits' eyes; in one instance a strain was carried on for three

generations, and the animals through which it had passed were used for cross immunity tests. These tests showed once more that there was no cross immunity between shop typhus and scrub typhus.

Tests were also made with the strains of tsutsugamushi and shop typhus which had been established in rabbits' eyes ; the results showed that there was cross immunity between them. The only differences between the two diseases are, the characteristic eschar and attendant bubo in the tsutsugamushi disease and also the longer fever and graver prognosis.

Several strains of virus were obtained from the brains of rats caught in places where cases of tropical typhus had occurred. These strains produced a positive Weil-Felix reaction when inoculated into rabbits, sometimes in high dilutions of over 1/1,500. They also produced a scrotal swelling with Rickettsia in the exudate when inoculated into guineapigs, but cross immunity tests appear to show that they are not identical with the human strains which have been established in animals.

There have been 623 cases of tropical typhus during the last four years ; 502 were rural or scrub typhus and 121 urban or shop typhus. The tsutsugamushi disease is comparatively rare : only 20 cases have been recognized in 6 years. Scrub typhus occurs in endemic form on three oil-palm estates in the Peninsula. Both living emulsions and alcoholic suspensions were used for the Weil-Felix reaction, and it was found that the readings with the living organisms were about 25 per cent. higher than with the killed suspensions. A locally isolated strain of XK was employed in many cases. [See Annual Report for 1931. This *Bulletin*, 1933, Vol. 30, p. 637.]

Enteric Fevers.—One hundred and eighteen cases of enteric fever were diagnosed bacteriologically or serologically. An analysis of 668 cases during the last 4 years gave the following percentages : 87·9 *Bact. typhosum*, 7·8 *Bact. paratyphosum A.*, 2·7 *Bact. paratyphosum B.* and 1·6 *Bact. paratyphosum C.* The blood clot from specimens sent for the Widal test was cultured in bile medium, with the result that enteric organisms were grown in 59 cases out of 288 where the Widal reaction was positive and in 5 cases where it was negative.

Vaccine Lymph.—The rabbit-calf-buffalo cycle for vaccine lymph production was continued during the year ; in 1,380 insertions made with lymph fresh from the refrigerator there were only 0·6 per cent. of failures, and, after keeping for 7 days at tropical room temperature, only 3·7 per cent. of failures. The potency of some of the batches of lymph stored at —23·3°C. (*sic*) was reduced by 50 per cent. in 18 months. Native mothers sometimes apply lime juice to the scarifications in order to prevent a " take," and it was found experimentally that this preventive was effective in 50 per cent. of cases, even if applied half an hour after vaccination.

Pasteur Treatment.—Antirabies vaccine was prepared as a 2 per cent. emulsion of sheep's brain, instead of a 1 per cent. emulsion of rabbit's brain. It was issued to various centres, and 103 persons received treatment. There were 3 deaths from hydrophobia ; one was a child who was treated from the second day, the second case was treated late and irregularly, the third case received no treatment. Ordinary cases received two inoculations of 2·5 cc. daily for 14 days ; when the bites were severe the treatment was continued for 21 days. There were no paralytic accidents. The mass inoculation of dogs was carried out during the early part of the year.

Division of Chemistry.—A large number of water samples and milk samples were examined in the Division of Chemistry, under Mr. R. W. Blair. Eleven cases of datura poisoning were among the toxological examinations; this drug is used by thieves to stupefy their victims. Thirteen samples of face powder, out of 20 examined, were found to contain lead. The sale of cosmetics containing lead is now forbidden by law. Other investigations included the examination of sewage effluents, drug samples, coins, spurious currency notes, etc. There was a considerable increase in the number of biochemical examinations. A course of lectures on scientific criminal investigation was given to police officers. The preparation of vitamin B extract by adsorption on to acid clay, according to the technique of Jansen and Donath, was continued. The dose of this powdered extract is 2·5 grams daily for prophylaxis and 5 for treatment.

Miscellaneous Investigations.—A unique and most interesting discovery was a case of human trypanosomiasis in a Sikh baby, which was due to infection with *T. lewisi*. The baby recovered without specific treatment, after a fever which lasted for several weeks.

An unsuccessful attempt was made to transmit leprosy by the inoculation of triturated nodules from human cases into rats which had been fed on a diet deficient in vitamins.

Other investigations included the typing of pneumococci, diphtheria (which is on the increase), skin diseases such as Singapore foot, and an eczematous condition which attacks labourers who work machines employed in making rubber crepe; it appears to be due to the acids which are used to coagulate the latex. There was also a host of routine examinations, such as precipitin reactions in connexion with medico-legal work, the bacteriological examination of milk and water, etc. Only one case of human melioidosis was diagnosed during the year, but the number of *post mortem* examinations, 219, was not large.

W. Fletcher.

British East African Territories, Conference of Governors of: **Research Conferences. Conference on Co-ordination of General Medical Research in East African Territories. Held at Entebbe, 27th to 29th November, 1933.**—35 pp. 1934. Nairobi: Govt. Printer.

This Conference was held at Entebbe in November, 1933 and was attended by 16 medical officers and specialists, 6 (including the Chairman, Dr. Kauntze) from Uganda, 5 from Kenya, 2 from Tanganyika, 1 from Nyasaland (Entomologist) and 1 from Zanzibar (Pathologist); Dr. Luc Fontana attended from Belgian Congo. The Report contains much that is of interest.

Centralization of the manufacture of vaccines and other biological and pharmaceutical products in the East African territories was discussed; the principle was approved but it was agreed that further centralization was at present impracticable. The importance of the standardization of medical records, especially vital statistics, and of the correlation of clinical and pathological records in every possible case, and the need for complete autopsies were emphasized.

With regard to meat and milk the Conference considered:—

"It would be of great advantage if these articles played a greater part in the dietaries of native peoples and held the view that this matter was chiefly a question of distribution as regards meat and of the introduction

of mixed farming as regards milk. . . . they desired to invite the attention of the Governors' Conference to the great importance to public health of research into the administrative problems involved."

They drew attention to the great value of propaganda, such as health weeks, baby weeks, cinema films, lectures and pamphlets.

Under the head of Rural Sanitation they directed attention to the five following subjects :—

" (1) the improvement of the economic conditions of the people ;
" (2) education in hygiene ;
" (3) the provision and improvement of water supplies both for domestic and agricultural purposes ;
" (4) the improvement of housing conditions ;
" (5) the conservation and disposal of manure,

and held the view that all of these matters are interdependent and progress with regard to any one is unlikely to be considerable unless attention can be directed to each of the others in the same area as far as possible at the same time."

They stressed the need of effective agricultural teaching and of the provision of trained sanitary inspectors in rural areas. They considered that research directed to the best means of providing and improving domestic water supplies would yield results of great sanitary and economic importance. In regard to the conservation and disposal of manure they " considered that ill-health in Africa is to no small extent a matter of poverty, poor nutrition and fly-borne diseases such as yaws, ulcers, the dysenteries and so on."

The agreement on research into disease and general problems is summed up in the medical research program, part of which is to be carried out in all territories and part in one or more of the 8 laboratories or institutions.

Investigations to be carried out in all territories :

Yaws and Syphilis.—Exchange of sera to ensure comparability of sensitivity of Kahn test.

Anaemia, primary and secondary ; *Blood Counts in Africans* ; *Composition of Normal Blood in Africans*.

Dysentery—Bacteriology. Interchange of cultures of local strains of dysentery group bacilli.

Malignant Disease—Collection of statistics by all medical officers.

Salmonella Group Infections—Interchange of cultures of local strains of typhoid group bacilli.

Tropical Ulcer—To be investigated wherever material available.

Yellow Fever—Systematic examination of populations for immunity to yellow fever.

Bacteriology of Water Supplies—Bacteriologists of territories to confer on program of research to be carried out as and when possible.

Precipitin Tests in Medico-Legal Work—Bacteriologists of territories to confer on standardisation of technique of precipitin test.

To be carried out at one or more laboratories :

Nutritional and Metabolic Problems—Basal metabolism of African.

Malaria—Precipitin tests of food supply of mosquito. Factors concerned in rendering certain waters favourable for breeding of anopheles : Testing anti-malarial oils : Fish for control of larval breeding.

Plague—Bacteriology : Rodent as reservoir and entomological aspect.

Tuberculosis (human and bovine).

Abortus Fever and Contagious Abortion.

Dysentery—Investigation of breeding places of house flies.

Helminthiasis. [Search in collaboration with Medical Research Council, for effective and cheap anthelmintics.]

Pneumonia—Typing strains of pneumococci and interchange of cultures and type sera.
Rabies.
Tropical Typhus.
Analysis of Locally Grown Food-Stuffs. *A. G. B.*

LAMBERT (S. M.). **Health Survey of British Solomon Islands Protectorate 1933.**—21 pp. 1934. Suva, Fiji: Govt. Printer.

The author has had an opportunity of visiting a number of inaccessible and unsophisticated islands. He records anthropological observations, and facts about the prevalent diseases.

Dr. Lambert has had an unusual opportunity of visiting some remote and particularly interesting islands in the Western Pacific. With the aid of a sympathetic millionaire and a private yacht, he has been to a number of places which are almost inaccessible to the ordinary traveller. In the course of the journey the party visited Tikopia, Sikaiana, the Duff Group, Anudha, Vanikoro, and several other small islands of great interest. Dr. Lambert was also able to pay a second visit to Rennell and Bellona.

A considerable part of this valuable report contains anthropological observations. The author is now better able to understand the religious system of the people of Rennell, and corrects several of the impressions which he received at his first visit. He devotes attention to the effect of Europeans on these small and unsophisticated communities, and he gives several examples in which the results of missionaries' activities seem to be unfortunate.

Medical investigations were also carried out. The author made a practice of counting the population by house-to-house visit, and he records the numbers and the proportion of sexes in adults and children. In one or two cases he gives also a record of births extending back for several years. Tuberculin tests were carried out, and it is interesting to note that the proportion of positives is materially lower among the almost untouched people of Rennell than elsewhere: but even on Rennell 60 per cent. of adults and 25 per cent. of children gave a positive reaction. Attention was also given to clinical evidence of tuberculosis, and to yaws and malaria; also to the state of the teeth. Members of the party collected mosquitoes on all the islands which were visited, and have added to our knowledge of the distribution of these insects.

P. A. Buxton.

INDIA. **Annual Report of the Public Health Commissioner with the Government of India for 1932. Vol. II.**—pp. iv+195. 1934. Delhi: Manager of Publications. [Re. 1–10 or 2s. 9d.]

This volume deals as usual with the health of the British and Indian armies in India. Malaria continues to hold pride of place as the scourge of the army in India and, as would be expected, the space allotted to the disease in this publication is proportionate to its importance. Although the year under review had the lowest malaria figures on record, the admissions for that disease formed nearly 15 per cent. of the whole. The report points out that the authorities well know how to deal with the malaria problem but the funds necessary to put this knowledge into adequate use are not available. The total sum allowed for anti-malaria field work for the year represented an expenditure per head of the military population of 10d., whereas in the last year for which figures are available, the expenditure on such field work in the Panama

Canal zone amounted to almost £1 16s. per head. The section dealing with malaria therapeutics is particularly interesting. It is claimed that a daily dosage of plasmoquine gm. 0·03 plus quinine grains 20 continued for three weeks has reduced the relapse rate in benign tertian malaria to under 5 per cent. The promised report on the curative effects of plasmoquine and atebrin in comparison with that of the combination just mentioned will be awaited with interest. Plasmoquine as a prophylactic was tested on a large scale during military operations in Burma, over 5,000 officers and men being the subject of the experiment. The results are described as moderately good, and it is considered that the daily dose employed, gm. 0·02, even if it did not prevent infection, exercised a powerful delay action without interfering in any way with the subjects' physical activities and general well-being. An effect that might be of outstanding importance in military operations.

Of the major tropical diseases, dysentery comes next in importance to malaria as measured by hospital admissions. During the past five years there has been an enormous expenditure of labour in searching for dysentery carriers among menials who are employed in handling food. In the year under review, 43 men infected with dysentery bacilli, and 388 who were passing *E. histolytica* cysts, were detected, the result of some 80,000 examinations—a poor halfpennyworth of bread to an intolerable deal of sack. Through these labours, however, some points of practical value have emerged. There is no record of the discovery of a symptomless carrier of dysentery bacilli, all positive results having been obtained in persons suffering from dysentery, either primary or relapsing. In order to escape the disabilities following detection, men have been encouraged by the present system of examination to conceal their disease whenever possible, and to remain at work during the only period when they are definitely infective. It is now proposed to adopt measures which will induce such dangerous persons to report sick so that they may be dealt with suitably. As regards amoebic dysentery, there is a striking lack of correlation between the number of persons passing cysts and the number of cases of amoebic dysentery. The wide variations in the percentage of carriers detected in different districts and at different times are not reflected in the incidence of the disease which pursues a steady course uninfluenced by alterations in this supposed reservoir of infection. Further, careful records have been kept of the incidence, by units, of amoebic dysentery, but at no time has the distribution suggested infection from a carrier ; on the contrary, it remains roughly proportionate to the numbers at risk. In view of these facts it has been decided to abandon the routine examinations originally adopted in the hope of excluding cyst-passers from duties involving handling of food.

This publication is of great value for it deals with the largest population in the Empire which is under continual medical observation and control, and where the after-results of medical treatment and of health measures generally can be determined to an extent impossible elsewhere. *W. P. MacArthur.*

NÄGELSBACH (E.). Ärztliche Erfahrungen im Hochland von Abessinien. [**A Physician's Experiences in the Highlands of Abyssinia.**] *Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Mar. & Apr. Vol. 38. Nos. 3 & 4. pp. 100–112 ; 147–155. With 1 fig. [14 refs.]

The author spent six years in Abyssinia, first in the Gore district at a level of 1,500–2,000 metres and then at Addis Ababa at 2,500 metres.

Autopsies are not permitted and bacteriological examinations were not possible. He gives a general account of his experience.

Enteric fevers are clinically common but positive agglutination with *Bact. typhosum* was unusual. Dysentery, both amoebic and bacillary, occurs but there is no record of liver abscess. Typhus is common, and lice infestation general; in two instances the author got a positive Weil-Felix reaction. Relapsing fever is very common [see this *Bulletin*, Vol. 26, p. 114]. It is not conveyed by ticks in the highlands for there are none; lice are here the vectors.

The highlands of Gore are also free from malaria and anopheles, except for cases in natives who come up from the lower levels, but at Addis Ababa malaria is found, *e.g.*, in 1929 in ten Abyssinians who had never left the capital; the author suggests that the vectors do not leave the houses at night. Lobar pneumonia is prevalent and very fatal. There is no plague, and no cholera recently. Tuberculosis of lungs, lymphatic glands, joints and skin is about as frequent as in mid-Europe, but the first-named takes a more rapid and severe course. He has reported on leprosy in another paper [*loc. cit.* Vol. 24, p. 551]. Leishmaniasis has not been seen in either of its forms.

He doubts the presence of undulant fever though that diagnosis is sometimes made, and objects that the Abyssinians do not drink goat's milk. Of eye diseases conjunctivitis, trachoma and iridocyclitis of unknown causation are common. He has reported on syphilis [see *Bull. of Hyg.* Vol. 1, p. 867]. He calls it exotic syphilis and says that it stands midway between old world syphilis and tropical yaws; the congenital disease is not seen. Mosquitoes are not seen in the Gore highlands. Phlebotomus, however, are troublesome in the dry season and are probably responsible for the short term fever which is then prevalent. The chigoe flea was reported by Lambie in 1920 as absent; in 1924 when the author arrived it was established; hence it must have reached Abyssinia between those dates. A skin affection which is contracted after passing through long grass in a particular region is probably due to a mite. Every Abyssinian has a tape worm; in fact since it takes 2 months for *T. saginata* to become mature he has 6 a year. No feast is held without raw beef. The above is a short account; those who wish for more information must read the paper.

A. G. B.

Congo Belge. Fonds Reine Elisabeth pour l'Assistance Médicale aux Indigènes du Congo Belge (Foreami). Rapport annuel 1932. [**The Activities of Foreami in Belgian Congo in 1932.**]—51 pp. With 2 folding maps. Bruxelles: 9a Rue des Petits-Carmes.

In 1932 the foundation known from its initial letters as Foreami [this *Bulletin*, ante p. 326] was active in the district of Bas-Congo and in a part of the mandated territory of Ruandi-Urundi, namely Tanganyika-Ruzizi. Whereas in the first all endemic and epidemic diseases were combated, in the mandated territory the foundation has concentrated on sleeping sickness. The success achieved is attributed to careful enumeration hut by hut of the population, treatment, with adequate record, of all the sufferers from diseases which it has been decided to combat, use of European personnel to carry out or supervise

the above-named objects and permanence of such personnel, unity of direction and continuity of work, assistance of administrative officers and of religious missions.

Report of the Sector of Bas-Congo (Dr. DUPUY, Director) :—

The personnel consisted of the Director, 13 doctors, 16 sanitary agents, a secretary and a clerk and a large number of native assistants, including 173 infirmiers. The number of effectives is related, amongst other things, to the existence or creation of roads traversible by motor cycle and this is considered so important that the foundation allots a credit to the natives for the making of such roads. Dispensaries to the number of 101 have been constructed, with houses for the native personnel. The enumeration of natives reached 579,303 and 531,798 were medically examined. Rather more than half the population were treated at the dispensaries and 21,206 in hospital. An account is given of the epidemic and endemic diseases met with. Of sleeping sickness 2,324 cases were diagnosed : over 10,000 patients were under treatment. It is interesting to read that lumbar puncture is demanded by the patients themselves. Of yaws 10,851 cases have been treated against 23,467 in 1931 ; this is regarded as a real decrease. In the course of 3 enumerations 900 lepers have been recognized. They are treated in villages of segregation attached to missions. The auxiliary service of Medical Assistance to Natives, designated SADAMI, treated in the year 129,210 new cases. Many details of their activities are given. Other data concern infant and maternal welfare, hygiene of villages, vital statistics.

Report of Dr. PRATI, *Director of the Sleeping Sickness Mission, Tanganyika-Ruizizi* :—

The personnel consists of the Director and three sanitary agents. The number of persons examined in the year was 58,693, and of these 1,054 were found infected, or 2·5 per cent. The percentage gets less as one travels south, being 6 per cent. in Ruzizi-Nord, and 1·5 per cent. in Nyanza-Lac which marches with Tanganyika Territory. Of the 2,499 patients treated 49 per cent. were apparently cured and 11 per cent. died. The author discusses the difficulties of combating sleeping sickness in this region. One particular difficult is in Bigarama in the north, where natives who live in the hills come to work in the infected plain and escape examination on their return. His proposals include suppression of these movements. *A. G. B.*

BURTON (A. W.). **Common Disorders among Adult Male Xosas and Fingoes in the Border Districts.**—*South African Med. Jl.* 1934. May 12. Vol. 8. No. 9. pp. 327–337. With 8 figs.

The author, who is a Medical Officer to the Native Recruiting Corporation Ltd., Kingwilliamstown, in the last 13 years has examined 33,308 male natives between 18 and 45 years for work on the Transvaal mines and has kept careful records. He notes that they were men who considered themselves fit for work, which accounted for the low percentage of some disorders, and that the standard of muscular development was high. The table gives the results (records of 3 and less are omitted).

Statistical Record.

Total Number of Recruits Examined, 33,308. Number rejected, 5,592 (16·5 per cent.).

Classification of Causes of Rejection.

(With the number rejected for each disorder and percentage of the total number examined.)

	Rejected.	Percentage.
Respiratory Disorders.		
Poor expansion	264	0·80
Silicosis	21	0·06
Tuberculosis	254	0·70
Pleurisy	18	0·05
Chronic bronchitis with emphysema	166	0·50
Asthma	7	0·02
Influenza	76	0·20
Ozaena	6	0·18
	812	2·51
Poor physique	2,833	8·5
Under age	924	2·8
Over age	91	0·2
Cardio-Vascular Disorders.		
Valvular disease of heart	190	0·60
Hypertrophy and dilatation	13	0·04
Varicose veins (marked)	19	0·06
	222	0·70
Adherent scars on legs	22	0·06
Old injuries	197	0·6
Defective vision	143	0·5
Venereal diseases	44	0·15
Ear diseases	28	0·98
Skin diseases, sores and ulcers ...	107	0·3
Enlarged glands	102	0·3
Spinal defects	6	0·018
Osteomyelitis	7	0·02
Hernia statistics.		
Among the 33,308, there were :—		
Inguinal (oblique)	11	0·03 (all rejected)
Umbilical	1,065	3·2

(Only nine rejected on account of large size and progressive nature.)

The silicosis cases had been diagnosed by radiography. [Was this contracted in previous service at the mines ?] The tuberculosis figure he remarks is low. In his private practice among 3,000 patients he found tuberculosis (mainly pulmonary) to cover about 9 per cent. In reference to the heading " poor physique " he considers the percentage of physically unfit among natives to be about 10 per cent. and contrasts this with the rejection for the army in Great Britain of over 50 per cent. Of the cases of valvular disease all had the physical signs of mitral disease ; neither aortic diseases nor aneurysm were met with. Of the defective vision rejects many had extensive leucomata due to corneal ulceration. Of the ear cases all were chronic suppurative otitis media. The enlarged glands were mostly situated in the triangles of the neck

and the suboccipital region : some were due to sepsis, others to tuberculosis : bovine tuberculosis is believed to be rare.

The author gives much space to hernia, in which he evidently takes a keen interest and surgeons should consult this part of his paper. He reaches the conclusion that umbilical hernia is very common among Xosas and Fingoes of all ages. The proportion in children under two is 40 per cent. ; in adult males 3·2 per cent. In practically every case the origin was congenital. Umbilical hernia is a hundred times commoner in these tribes than inguinal. Incarceration and strangulation are rare. *A. G. B.*

JAVETT (S. N.). **Notes on Some Conditions in Zululand.**—*South African Med. Jl.* 1934. Jan. 27. Vol. 8. No. 2. pp. 55–56.

A chatty article on malaria, anthrax, amoebiasis, epidermophytosis and ankylostomiasis in natives.

The author holds that neosalvarsan is capable of resensitizing to quinine a patient who has ceased to react to that drug ; he regards it as a useful adjunct to quinine and atebrin. He notes that the use of emetine in natives is followed in 20 per cent. of cases by generalized oedema. *A. G. B.*

NEDERLANDSCHE VEREENIGING VOOR TROPISCHE GENEESKUNDE. le Gezamenlijke vergadering met de Belgische Vereeniging voor Tropische Geneeskunde op 24 en 25 Maart 1934, in de Afd. Tropische Hygiëne van het Kon. Koloniaal Instituut te Amsterdam. [**1st Combined Meeting of the Netherlands and Belgian Societies of Tropical Medicine, Amsterdam, 1934.**] [SNIJDERS (E. P.), President.] —*Nederl. Tijdschr. v. Geneesk.* 1934. June 23. Vol. 78. No. 25. pp. 2945–2985. With 2 figs. (1 map).

At this, the first combined session of the two Societies, a number of interesting papers and discussions took place. The main subjects discussed were (1) plague, (2) schistosomiasis and (3) yellow fever. Much of the treatment and discussion covered familiar ground but some of the points dealt with are of present importance or will bear repetition.

I *Plague* : Professor L. OTTEN has always maintained a critical attitude with regard to prophylactic and therapeutic measures against plague. In Java much attention has been paid to the possibility of breaking the chain of events leading, by way of the house rat, to epizootic and epidemic plague conditions. An endeavour has been made to carry out a program of re-housing the indigenous population of the interior. This, although ideal, has been costly and is slow in execution ; it would not serve to meet the case of a sudden epidemic. Plague prophylactic vaccination, which does not suffer from this drawback, comes in for criticism on the score of the unreliability of most of the current statistics. Stress is laid upon the necessity of adoption of the alternate case method of procedure to obtain really valid statistical data ; it is " the only way to obtain completely comparable material." An opportunity offered during 1920 to 1922, at the time of a plague epidemic in middle Java, to apply this test for a total of about 37,000 vaccinated individuals and an approximately equal number of controls. The reduction of mortality among the former to one-half of the latter was not a sufficiently striking one to justify the application of the vaccine, which was used at that time upon a large scale. Other vaccines may possibly be more effective, but

before animal experimentation with these can be accepted as applicable to man, it is necessary to realize that the results obtained will depend upon the susceptibility-position of both the animals used and of man to the injection of living test plague bacilli (Otten, *ante*, p. 35). Otten himself appears to favour the use of a living vaccine prepared from a strain of plague which is non-virulent for the house rat. He has obtained such a strain and has applied himself to the question of " dissociation " of the strain into " smooth " and " rough " types. A vaccine of the smooth component proved much the more efficient and that too in such susceptible animals as the house rat and the guineapig. Its further use in man awaits a trial.

Professor Flu also presents his case for immunization against plague by means of bacteriophage lysates of virulent plague bacilli (*ante*, p. 34).

II *Schistosomiasis* : The results of schistosomiasis in the province of Katanga (Belgian Congo) were presented by Dr. L. van den Berghe. Six different schistosomes are referred to—*S. mansoni*, *S. haematobium*, *S. rodhaini* (found in the mesenteric vessels of a mouse), *S. bovis*, *S. matthei* (found in sheep, oxen and man) and *S. margrebowiei* (found in the mesenteric vessels of certain antelopes). The measurements, together with an illustration, of the eggs of these species are given.

A description of the fresh water snails which harbour schistosome cercariae is given—five genera, *Planorbis*, *Physopsis*, *Lymnaea*, *Bulinus* and *Melanoides*. Of these *Planorbis* is, just as in South Rhodesia, the intermediate host of *Schistosoma mansoni* and *Physopsis* of *Schistosoma haematobium*. Other sections of this paper deal with the pathology of human schistosomiasis in Katanga, medical treatment and prophylaxis.

III *Yellow Fever* : Duren and Van Hoof presented a paper on the preliminary results of an inquiry into the endemicity of yellow fever in the Belgian Congo. This inquiry was entomological, epidemiological and serological. One of the commentaries on the subject is put in the form of three questions relating to the " protection test " for yellow fever as elaborated by the American commission in Lagos. These are :—(1) Has the protection test the value which the American authors place upon it ? (2) Do not other affections confer upon the indigenous population a non-specific protective power ? (3) Do natives of the country possess, naturally or racially, protective antibodies ?

The answers to these questions varied for the authors and those who took part in the discussion. Both positive and negative answers were given.

The conference has evidently been very successful and is to take place alternately in Belgium and the Netherlands. *W. F. Harvey.*

Buxton (P. A.) & Mellanby (K.). **The Measurement and Control of Humidity.**—*Bull. Entom. Res.* 1934. July. Vol. 25. Pt. 2. pp. 171–175. With 2 figs.

Some of the effects of humidity upon insects cannot be predicted and are inexplicable though important. In experimental work humidity should always be measured and controlled. The difficulties of doing this are considerable, for the experimental entomologist is confronted by problems of many different types.

In the present paper a number of methods are mentioned, one or other of which may perhaps be found useful. For instance, the

humidity of a very small space among growing leaves or in an animal's nest or between the clothes and the body may be measured with about 10 mgm. of notepaper, the weight of which is affected by the relative humidity to which it has been exposed : the paper has been previously calibrated and is weighed quickly on a torsion balance. For controlling humidity, mixtures of sulphuric acid and water have generally been used, but it is extremely difficult to obtain a sufficient supply of pure acid in a remote country. It is probable, therefore, that tropical workers will prefer to use aqueous solutions of potassium hydroxide, and that they will welcome the curve which relates the specific gravity of the solution to the relative humidity of the air over it : titration of the solution is no longer necessary. *P. A. Buxton.*

Mellanby (Kenneth). **The Influence of Starvation on the Thermal Death-Point of Insects.**—*Jl. Experim. Biol.* 1934. Jan. Vol. 11. No. 1. pp. 48–53. With 2 figs.

It is well known that the temperature which is fatal to certain insects is greatly affected by humidity. In the present paper it is shown that it is also much affected by the nutritional state of the insects.

Earlier writers who attempted to define the thermal death-point of insects frequently obtained conflicting results ; published figures of Musca are at least 5°C. from one another. Recent and more analytical work has shown that there are a number of factors, particularly if exposure is prolonged. For instance, if insects are exposed to temperatures above 40°C. for one hour, a very precise lethal temperature may be defined, which is probably due to heat by itself ; but on longer exposures, insects will die of heat in moist air, but certain species die at much lower temperatures in drier air owing to exhaustion of water. The author, having standardized these two factors, now proceeds to study the effect of nutrition on the death of newly-hatched larvae of *Pediculus humanus* and adults of *Culex fatigans*. He found that the highest temperature survived for one hour by larval lice is 46·5°C. and that it makes no difference whether they had fed or not. But on a 24-hour exposure, recently fed larvae withstand 38°C. in moist air and 33°C. in dry ; larvae which have not been fed die at lower temperatures, there being great variation between one individual and another. Doubtless death is due to exhaustion of reserve food, the rate of metabolism being high at these temperatures. The figures for Culex are essentially similar.

[The thermal death-point is a relatively simple matter, yet it involves several factors and an enormous amount of work to define it. Shall we ever get precise knowledge of the conditions which are optimal for life and reproduction ?] *P. A. B.*

Cook (S. S.). **Insect Control.**—*U.S. Nav. Med. Bull.* 1934. Apr. Vol. 32. No. 2. pp. 229–247.

The paper gives a condensed account of methods of killing insects, particularly those of importance in relation to medicine. It appears to be a sound and up-to-date piece of work, but it does not lend itself to summarisation. As it is rather short, the value might perhaps have been increased it if had included an annotated list of books and important papers on the subject. *P. A. B.*

BABER (E.). **Note on Experiments made with the Object of finding an Efficient and Economical Insecticide Spray for the Destruction of Mosquitoes and Flies.** *Jl. Roy. Army Med. Corps.* 1934. June. Vol. 62. No. 6. pp. 411–418.

The author has endeavoured to find a spray which is efficient and economical, and which must kill adult flies and mosquitoes.

The paper reports a solid piece of work carried out by an approximately uniform procedure. The author has tested a number of proprietary sprays and has made up liquids according to published formulae. He has made a special study of pyrethrum, and he finds it convenient to use the concentrated extracts which are on the market.

In nearly all his tests, he reports a high proportion of recoveries if he examines 3 to 12 hours after spraying; indeed, it seems that he rarely attained a 100 per cent. kill. Mosquitoes were much more easily killed than flies, with very nearly every liquid which was tested. He finds that a saturated solution of naphthalene in commercial paraffin is fairly satisfactory, and that the cost is low. For most purposes, he is inclined to recommend the following formula:—"1 : 64 Stafford Allen's liquid extract of pyrethrum+5 per cent. oil of citronella+15 per cent. petrol+paraffin oil (ordinary burning fluid)." There is some risk of fire from the use of this mixture. *P. A. B.*

GINSBURG (J. M.). **Mosquito Larvicide.**—*New Jersey Agr.* 1933. Vol. 15. No. 4. p. 4. [Summarized in *Experiment Station Rec.* 1934. Apr. Vol. 70. No. 4. p. 509.]

"The author has found that a larvicide consisting of two thirds by volume of kerosene or of a similar light petroleum oil, to which had been added enough pyrethrum extract to equal that of 1 lb. of pyrethrum flowers and one-third water containing about 5 per cent. of soap, can be prepared or purchased at a cost even lower than that of oil per spray gallon. This stock solution is mixed with 9 to 10 parts of water prior to application and sprayed on the breeding place. It has been extensively used during the last two years by the mosquito commissions in New Jersey and other States on all kinds of fresh-water breeding places with an appreciable saving of money. It is the outcome of work aimed to meet objections to the use of white petroleum oil, which is injurious to waterfowl, fish, and aquatic plants.

FENG (Lan-chou). **A Brief Mosquito Survey in Some Parts of Central China.**—*Chinese Med. Jl.* 1933. Nov.–Dec. Vol. 47. Nos. 11 & 12. pp. 1347–1358. With 2 figs. on 1 plate. [18 refs.]

During a period of less than seven weeks (10th August to 25th September) in the summer of 1932, the author made a rapid mosquito survey of "representative parts of three provinces of Central China, namely the Wuhan area of Hupeh, Kiukiang of Kiangsi, and Chinhwa, Hangchow, Wuk'ang and Huchow of Chekiang." The present paper gives lists of twenty-seven species of mosquitoes, including five of Anopheles, of which larvae or adults were obtained, and in each case notes are added on breeding places (where known), and the names of associated species are given. The evidence afforded by this collection, so far as it goes, supports WALLACE in placing the boreal limit of the Oriental Region in China at least at 30°N. *Anopheles minimus*, which in South China, as in Tonking and the Philippines, is the most important natural vector of malaria, was found in Chinhwa and Kiukiang.

E. E. Austen.

LEGENDRE (J.). La longévité chez les larves d'un moustique arboricole. [**Larval Longevity in a Tree-hole Mosquito.**]—*C. R. Acad. Sci.* 1934. Mar. 26. Vol. 198. No. 13. pp. 1263–1265.

On 7th July, 1932, in a hollow in an elm, the author found larvae, pupae and adults of *Aëdes geniculatus*, a common European mosquito which breeds exclusively in holes in trees. Kept in a bottle, in a mixture of the original and tap water, without food and, during the first winter, exposed to frost, two of the larvae survived without apparent change until 6th January, 1934—a period of eighteen months—when the larger one was found dead, while the other was still alive. Assuming—what has yet to be proved—that such longevity occurs in nature, and that it is followed by metamorphosis into the adult state, Legendre sees therein a means of insuring the survival of the species when faced with unfavourable conditions, such as those resulting from the exceptionally dry summer of 1933. *E. E. A.*

BRADLEY (G. H.). **A Method for shipping Mosquito Eggs.**—*Jl. Econom. Entom.* 1934. Feb. Vol. 27. No. 1. p. 289.

The term " Shipping " in the title is American for " sending by post." During the autumn and winter of 1932–33, the Bureau of Entomology in Washington was kept continuously supplied with living larvae of *Culex quinquefasciatus* by hatching them from egg-rafts forwarded daily from Florida—a method found preferable to sending larvae in stoppered bottles. After being collected from artificial breeding-places, the egg-rafts were placed in 1½ inch cardboard pill-boxes, each of which could readily contain from 100 to 125 rafts. The preparation, filling and packing of such a box for transmission in an envelope is described. After reaching Washington on the morning of the next day but one, the eggs were floated out into breeding jars, where they promptly hatched. *E. E. A.*

HINMAN (E. Harold). **Predators of the Culicidae (Mosquitoes). I. The Predators of Larvae and Pupae, exclusive of Fish. II. Predators of Adult Mosquitoes.**—*Jl. Trop. Med. & Hyg.* 1934. May 1 & 15. Vol. 37. Nos. 9 & 10. pp. 129–134; 145–150. [128 refs.]

The author has collected available information about the destruction of mosquitoes by predators. He discusses the practical application of this work.

The paper includes a large body of fact, some of it original but most of it collected from the literature. The information is arranged under the systematic position of the predator, larval and adult mosquitoes being treated separately. Fish are almost entirely excluded, because a summary of the available information about them was published in 1924. The author has wisely not attempted to be critical.

The lists include an astonishing range of animals. It is quite familiar that mosquito larvae are attacked by Hydra, larval dragon-flies and aquatic bugs and beetles, but it will surprise most readers to see Daphnia, rotifers and leeches in the list of predators. It is also surprising that grasshoppers occasionally prey on adult mosquitoes.

The records which are here gathered together are of unequal value. Some of them relate to observations made in small glass containers in which perhaps there was little chance of escape for the mosquito larva

and little other food for the animal which assumed the rôle of predator. The observations made in the field are of more value, but much more difficult to obtain because the destruction of the insect can only be seen at one instant. It might be possible to carry out experiments under nearly natural conditions in a small tank containing a complex but fully known fauna and flora.

It is difficult to see that much practical use can be made of observations on this subject, and the reader will probably accept the author's conclusion that the predators can only be introduced or encouraged to multiply in small artificial containers of water. *P. A. Buxton.*

Chéneveau (R.). Note sur les trous de crabes à Anécho (Togo). [**Note on Crab Holes at Anecho.**]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6. pp. 590–593.

A further contribution to the fauna of crab holes on the West coast of Africa [see this *Bulletin*, Vol. 26, p. 807].

At Anecho, Togoland, situated between a lagoon and the sea, in three months the author examined 7,534 crab holes, 2,320 of which are described as large ; of the latter two-thirds harboured mosquitoes. Of those sent to Dakar for identification all but two (*A. costalis*) belonged to the genus *Aëdes*, probably *Aëdimorphus irritans*, which breeds in brackish water and is known to favour crab holes. The author stopped the holes, kept their surroundings as clean as possible and free from vegetation, and maintained fowls and ducks as auxiliaries ; the result was encouraging. It is not clear whether *A. aegypti* was found or not [but their larvae have been found by others]. *A. G. B.*

Patton (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Species of the Genus *Musca*, based on a Comparative Study of the Male Terminalia. II. A Practical Guide to the Palaearctic Species.**—*Ann. Trop. Med. & Parasit.* 1933. July 7 & Oct. 21. Vol. 27. Nos. 2 & 3. pp. 327–345 ; 397–430. With 22 figs.

For Part I of this series, in which, on the basis of the male terminalia (genital armature), the species of *Musca* were divided into three groups, see this *Bulletin*, 1933 [Vol. 30, pp. 309–310]. The present contribution includes useful keys, founded on external characters, to the two sexes of sixteen palaearctic species, as well as brief descriptions of and notes on the species themselves. In addition, for the benefit of those who may wish to make quite sure that their specimens are correctly determined, the method of preparing permanent mounts of the male terminalia is described.

So important in medical and veterinary practice are the common house-fly and its allies, and at the same time so difficult to differentiate with certainty, that the author of this elaborate and detailed paper deserves the gratitude of all who may henceforth be concerned with these troublesome insects. The more the pity then that in two several instances (*vertex* in the sense of frons or front ; and *posterior pronotum* for humeral callus) his terminology is at variance with that commonly employed among Dipterists ; that, in describing the abdomen, he uses *sternum*, instead of ventrite which is logically correct ; and that readers are particularly requested to note " that the descriptions of . . . colour markings are drawn up with the head of the specimen directed towards

the observer," which is exactly the opposite of the practice otherwise universal among entomologists, and may entail unfortunate results should reference be made to original authorities. *E. E. Austen.*

PATTON (W. S.). **Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Tribe Muscini, Subfamily *Muscinae*, based on a Comparative Study of the Male Terminalia. II. The Genus *Stomoxys* Geoffroy (sens. lat.).**—*Ann. Trop. Med. & Parasit.* 1933. Dec. 20. Vol. 27. No. 4. pp. 501–537. With 15 figs.

More than eighteen months have elapsed since the author first published his conclusion, based on an examination of male terminalia, that the blood-sucking Muscidae of the subfamily Stomoxydinae are congeneric, and referable one and all to the single genus *Stomoxys* (see this *Bulletin*, 1933, Vol. 30, p. 310) ; and that consequently the retention of such generic designations as *Lyperosia, Haematobia, Stygeromyia*, etc., is unwarranted. In the present contribution an attempt is made to justify this revolutionary proposal, and in the course of the argument J. R. MALLOCH, prolific writer on the Muscoidea, is severely criticized. The extent to which the author has succeeded in establishing his case is a matter for individual judgment, but a few comments may perhaps be made here.

In the taxonomy of the Diptera, most of the plastic differences on which reliance is legitimately placed are those of degree and not of kind ; and if divergences such as are exhibited in Stomoxydinae by arista, proboscis, palpi and venation are to be regarded as of less than generic value, classification, far from being simplified, will be rendered more difficult. No systematist will deny the categorical value of the male terminalia in certain cases ; but to use them as though they alone need be considered, throughout a group of forms divergent in other respects, is to arrive at a *reductio ad absurdum*.

The categories in Stomoxydinae accepted by Dipterists as genera are based in each case not on one set of characters but on several. If, when reference is made to the male terminalia, *Stomoxys, Lyperosia* and the rest are found to be generically inseparable, the logical deduction must be that in this instance, as in others with which the author is possibly unacquainted, the court of appeal selected is incompetent. *E. E. A.*

HARVEY (W. Henwood). **A Case of Myiasis, due to *Calliphora erythrocephala*, occurring in Man.**—*Parasitology*. 1934. June. Vol. 26. No. 2. pp. 306–307.

The patient was a farm labourer of 59 employed near Cambridge. Between 1929 and 1932 three operations were performed for urethral stricture, including suprapubic drainage and for perineal fistula. He continued to get about. In October 1933 living maggots were found in vomit, faeces and urine, the bladder being in a foul condition. The patient died a month later ; there was no autopsy. Of 114 flies which hatched from larvae all but three were *Calliphora erythrocephala*. The author believes that there was communication between bladder and intestine and that the eggs may have been conveyed on the man's fingers from the suprapubic sinus to his mouth and then swallowed. The original site of the infestation was probably the opening into the bladder. *A. G. B.*

Hoeppli (R.) & Watt (John Y. C.). **Experiments on Resistance of Dipterous Larvae in Connection with the Problem of Intestinal and Urinary Myiasis.**—*Chinese Med. Jl.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1298–1306. [19 refs.]

Larvae of *Chrysomyia megacephala* and *Lucilia sericata* survived immersion in urine at room temperature without feeding for 48 hours. When fed (in air) for 15 minutes each day, they survived 3 or 4 days. This resistance to lack of oxygen explains how larvae can live in the urinary and intestinal tracts of man. A review of previous work is given.

V. B. Wigglesworth.

Galliard (Henri). Un nouveau cas de myiase oculaire due à *Oestrus ovis* en France. [**A New Case of Ocular Myiasis in France caused by** *Oestrus ovis*.]—*Ann. Parasit. Humaine et Comparée.* 1934. May 1. Vol. 12. No. 3. pp. 177–181. With 2 figs. [26 refs.]

Since the brothers Sergent, in 1907, recorded the production in Algeria of ocular myiasis in man by larvae of the sheep bot-fly (*Oe. ovis*) [*ante*, p. 358], similar attacks by this insect upon human beings have been recorded from Sicily, the Cape Verde Is., Constantinople, U.S.A., Spain and Corsica. The few cases of the kind reported as having occurred in France include two in the suburbs of Paris. The instance which has given rise to the paper under review occurred at Lourdes (Hautes-Pyrénées), where larvae were injected into the patient's eye at 7.0 p.m. on August 4th.

Ocular myiasis in man is nearly always due to either *Oe. ovis* or the somewhat smaller *Rhinoestrus purpureus*, the larva of which is normally a naso-pharyngeal parasite of the horse. The distinctive characters of the first instar larvae of these two species are given.

E. E. Austen.

Hull (J. B.), Dove (W. E.) & Prince (F. M.). **Seasonal Incidence and Concentrations of Sand Fly Larvae,** *Culicoides dovei* **Hall, in Salt Marshes (Ceratopogoninae : Diptera).**—*Jl. Parasitology.* 1934. Mar. Vol. 20. No. 3. pp. 162–172. With 7 figs.

The authors present a detailed study of the breeding places of Culicoides in the south-east United States.

Thanks to the work of this group of authors, a considerable advance has been made in knowledge of the breeding places and seasons of midges (Culicoides). They have developed a technique by which they isolate and count larvae from a quart of surface soil ; occasionally the number of larvae approaches 200. In the present paper they describe and illustrate the type of spot in which large numbers of *Culicoides dovei* were found. It appears that the larvae require shade and salinity. The observations were made in South Carolina.

P. A. Buxton.

Moshkovski (S. D.) & Nossina (W.). [**A Method of staining Sandflies for Use in the Study of their Biology and Ecology.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. No. 6. pp. 407–409 [In Russian.]

The following method was used for marking sandflies for observations on their bionomics. The dry stain—methylene blue, basic

fuchsin or gentian-violet—was finely powdered and sprinkled over the bottom and walls of a glass receptacle (specimen tube, etc.). When the insects jump about near the wall in their characteristic way, the stain becomes entangled in their hairy covering and is retained there up to 12 days after liberation of the insect. The identification of captured sandflies was made by placing the killed insect on a piece of filter paper and moistening it with a drop of alcohol. The alcohol dissolves the dye and the filter paper shows a blot of the appropriate colour.

C. A. Hoare.

Wigglesworth (V. B.) & Gillett (J. D.). **The Function of the Antennae in *Rhodnius prolixus* (Hemiptera) and the Mechanism of Orientation to the Host.**—*Jl. Experim. Biol.* 1934. Apr. Vol. 11. No. 2. pp. 120–139. With 5 figs. [40 refs.]

The scope of this paper is indicated by its title.

The authors describe experiments in which blood-sucking bugs (Rhodnius) were subjected to simple stimuli under carefully controlled conditions. The insect is normally in a state of sleep from which it can be roused by bringing a warm test tube near to it. It first raises and extends its antennae, apparently in order to discover the source of stimulus. It then advances, till an antenna touches the tube, when it extends its proboscis and attempts to probe. The authors believe that response is produced by convection currents, and not by radiant heat [a point on which the reviewer is not convinced]. Rhodnius possesses also a sense of smell, the sense organs of which appear to be in the antennae.

If the eyes are completely covered with black paint, the insects react normally to a warm tube: they also do this if deprived of the proboscis. If the antennae are removed, the insects see and pursue moving objects, and even without the use of antennae and eyes they respond to vibration.

A number of other topics are discussed. There is a description of several types of sense organs, located in the antennae, and the paper includes a discussion of modern theories of animal orientation. It helps us to understand how it is that a blood-sucking insect finds its host (though the authors only consider insects which are within a few inches of the source of stimulus). *P. A. Buxton.*

Feng (L. C.) & Hoeppli (R.). **On Some Histological Changes caused by Mites.**—*Chinese Med. Jl.* 1933. Nov.–Dec. Vol. 47. Nos. 11 & 12. pp. 1191–1199. With 6 figs. on 3 plates. [15 refs.]

The authors support previous observers in finding that the tubular structures extending from the mouth-parts of mites into their host (the "stylostome," "Saugrüssel," "Sangschlauch" or "langue") are really products of a protective tissue reaction on the part of the host. A necrotic area surrounded by inflammatory cells is described in the case of the gecko. In insects (for example, mosquitoes attacked by hydrachnid mites) the epidermal cells grow downwards from the point of entry of the mouth-parts and give rise to a long chitinous tube with convoluted walls extending far into the insect body. [See also Vitzthum, this *Bulletin*, Vol. 27, pp. 922–3.] *V. B. Wigglesworth.*

KOBAYASHI (Y.). **On the Bite caused by a "House Tick."**—*Japanese Jl. Dermat. & Urol.* 1934. Jan. Vol. 35. No. 1. [In Japanese. pp. 71–78. With 7 figs. [14 refs.] English summary pp. 7–8.]

Mites having the characters of *Liponyssus bacoti* and *L. nagayoi* have lately been troublesome in Tokyo and other large cities of Japan. The skin lesions caused, chiefly red papules, are described in two patients.

A. G. B.

MACLEOD (J.). *Ixodes ricinus* **in Relation to its Physical Environment : the Influence of Climate on Development.**—*Parasitology.* 1934. June. Vol. 26. No. 2. pp. 282–305. With 6 figs.

The author has carried out a number of experiments with ticks, *Ixodes ricinus*, exposing them to controlled conditions of temperature, humidity and pressure. He discusses the theoretical aspect of some of his conclusions.

It is found that this tick can develop over a wide range of temperature from 15 to 35°C. But the favourable range of humidity is very narrow, for the animals only live well in air which is close to saturation. The effect of unfavourable dryness is very complex and appears in different ways in the experiments : for instance, the period between feeding and moulting in the life of the larva is prolonged at lower humidities. The particular tick which the author used—*Ixodes ricinus*—is not of itself of much interest to medicine. But the paper merits study by those who may be interested in the general relation between ticks and climate.

P. A. Buxton.

COOLEY (R. A.). **Occurrence of Tick Parasites in Nature in Southern Idaho.**—*Public Health Rep.* 1934. Jan. 26. Vol. 49. No. 4. pp. 111–112.

Records the discovery of *Ixodiphagus texanus* Howard on a tick taken from a woodchuck in Idaho ; this parasite was last reported in 1907 on the rabbit tick *Haemaphysalis leporis-palustris* Packard in Texas. *A. G. B.*

DEASIS (Cesareo). **"Red Back" Spider Bite and Magnesium Sulphate Treatment. A Clinical Study of Four Cases.**—*Amer. Jl. Trop. Med.* 1934. Jan. Vol. 14. No. 1. pp. 33–44.

The author describes the clinical symptoms which follow the bite of the spider (*Latrodectus hasseltii*), and its treatment by intravenous magnesium sulphate.

The spider is widely distributed (Australia, New Zealand, Philippines), and very venomous. The bite produces immediate and acute local pain followed by numbness ; the general symptoms are rapid respiration and high blood pressure, with profuse perspiration and paralysis of the lower limbs. The condition of the patient often remains grave for several days, and the bite is occasionally fatal. Rapid amelioration of the symptoms and improvement of the patient's general condition follow the intravenous injection of 10 cc. of 25 per cent. magnesium sulphate, repeated if necessary.

P. A. Buxton.

VELLARD (J.). Variations de la réaction des venins d'araignées. [**The Reaction of Spider Venom.**]—*C. R. Acad. Sci.* 1934. June 11. Vol. 198. No. 24. pp. 2123–2124.

Some authors have found spider venom to be acid, others alkaline; WALBUM has shown that the venom of a spider may be sometimes alkaline and sometimes acid. From observations made on spiders in Brazil and in Paraguay the author finds that it is temperature that determines the reaction. At Rio in the hot season almost all the venoms are alkaline; at S. Paulo, a colder region, the venom of the same species is almost constantly acid in winter. A laboratory experiment in which one lot of spiders was kept at 15°C. and another at 33°C. led to the same conclusion. Alkaline venoms are more toxic than acid venoms. *A. G. B.*

CROSFILL (J. W. L.). **Notes on an Epidemic of "Spider Burn" in Chungking, during August and September, 1933.**—*Jl. Roy. Nav. Med. Serv.* 1934. Apr. Vol. 20. No. 2. pp. 174–178. With 4 figs.

The clinical features of "spider burn"—the painless, shallow, well defined vesicles filled with yellow exudate—are described, and evidence is brought forward that the condition is due to a secretion by an insect referred to as a "flying ant." [From the author's figure the insect appears to be a Staphylinid beetle probably belonging to the genus *Paederus*. Species of this genus are responsible for "spider lick" and similar conditions in many parts of the world.] During the epidemic in question, almost every person in ships and ashore was attacked. The condition had previously been practically unknown in Chungking.

V. B. Wigglesworth.

BERNTROP (J. C.), Jr. Over ziekteverschijnselen veroorzaakt door in de noordzee voorkomende kwallen. [**Symptoms produced by Contact with Jelly Fishes of the North Sea.**]—*Nederl. Tijdschr. v. Geneesk.* 1934. May 12. Vol. 78. No. 19. pp. 2084–2089. [Refs. in footnotes.] English summary (4 lines).

The occurrence, in the author's own experience, of one or two cases of symptoms developing from contact with jelly fish during bathing is the occasion for this article on the toxic action involved. Most frequently the effects are purely local and amount merely to redness or urticaria. Moreover even these slight effects are by no means invariable. In the more severe cases general symptoms have supervened and these are compared with the effects which led RICHET to the enunciation of the doctrine of anaphylaxis. The immediate effects are given as feeling of extreme fatigue, pallor, small pulse, respiratory distress and excruciating lumbar pain reminiscent of renal colic. This last symptom is ascribed to renal congestion. One medical writer describes his personal impression as being a "sort of enanthem on all mucous membranes." Reference is made to the tropical jelly fishes where the symptoms produced may have a fatal outcome. The remedies used in treatment of the condition have been, the local application of weak ammonia, aspirin, morphine, adrenalin and alcohol. *W. F. Harvey.*

DE JESUS (Zacarias). **Experiments on the Control of the Common Water Leech,** *Hirudinaria manillensis.*—*Philippine Jl. Sci.* 1934. Jan. Vol. 53. No. 1. pp. 47–65. With 2 plates. [14 refs.]

The author conducted experiments in the laboratory with a view to finding a practical way of controlling or exterminating this leech, which feeds on buffaloes and cattle.

The carabao leech, as it is called, is fairly abundant in the Philippines and is found also in Java, Ceylon, Southern India and Siam. It attacks men who work in paddy fields or fish in leech-infested waters. A mature *H. manillensis* can suck 10 to 20 cc. of blood. He found that a 1 in 50,000 solution of copper sulphate killed both young and mature leeches and suggests the broadcasting of this chemical on the water or the dragging of a bundle containing the commercial sulphate through it. If the infested place is limited in area, crude common salt may be broadcast to form a 2 to 3 per cent. solution; tobacco midribs or an infusion of them may be similarly employed. Waste midribs may be dumped into leech-infested places. Either a 1 : 100 infusion of tobacco or a 5 per cent. solution of common salt should be useful in dislodging leeches which have become attached. Derris is poisonous to leeches as it is to fishes and since it grows in the islands its use should be practical and economical. A duck, *Anas boschas* Linn., was found to consume *H. manillensis*, searching for it in infested pools. [It does not appear that the author tested any of the chemical methods in the field.]

A. G. B.

ADAMS (A. R. D.) & WEBB (Lewis). **A Survey of the Protozoal and Helminthic Infestation-Rates of the Male Prison and Reformatory Inmates of Beau Bassin Prison, Mauritius.**—*Ann. Trop. Med. & Parasit.* 1934. Mar. 29. Vol. 28. No. 1. pp. 25–35. [18 refs.]

The authors note that apart from hookworm surveys carried out between 1921 and 1923 no investigation of this kind has been made in Mauritius. They mention the mixed character of the population and the primitive habits of the majority, though the estates are well provided with latrines or buckets. The prison in which their observations were made receives its inmates from a prison at the capital, Port Louis, where the prisoners are detained until their conviction and many are treated there with chenopodium as well as for dysentery.

An account is given of previous investigations of this kind both in temperate and tropical regions; this brings out, especially in the tropics, the great variation in the findings, *e.g.*, for *E. histolytica* from 13·7 per cent. at Alexandria (WENYON & O'CONNOR, 524 native prisoners) to 72 per cent. in Panama (FAUST, 2,000 persons). The results are set out in four tables, for protozoa and helminths in 428 adults and 57 children.

The conclusions are as follows:—

"1. In view of an outbreak of an acute type of dysentery with a relatively high mortality, frequently diagnosed locally as 'amoebic' in origin, during the hot months of 1932–33, an investigation was undertaken to determine the relative frequency of the intestinal protozoa, more especially of *Entamoeba histolytica*, among a sample of the general population of Mauritius.

"2. It was found that a neighbouring prison and attached reformatory school provided a suitable field for the enquiry, and the technique employed

for collecting and examining the stools of the inmates of these institutions is described.

" 3. Three stools from each case were examined in the stated routine manner ; final determination of the presence or absence of protozoa and the determination of the species present rested on study of permanently stained wet-fixed films. Helminth ova were sought for by a flotation concentration technique.

" 4. Figures are given in tabular form showing the parasitisation-rates with the various intestinal protozoa and helminths. *E. histolytica* was found to be the most prevalent protozoon, 38·5 per cent. of 428 adults and 31·6 per cent. of 57 juveniles harbouring this parasite. Of the helminths, *Trichuris trichiura* was found in 91·1 per cent. of the same adults and in 100 per cent. of the juveniles.

" 5. There is an astonishing diversity between the findings of the various workers in the tropical and sub-tropical zones in respect of the incidence of the intestinal protozoa, more particularly of *E. histolytica* ; and one is forced to the conclusion that there may be other factors than simple exposure to infection necessary for successful parasitisation with these parasites and that further reliable records may assist in elucidating the nature of these factors."

The findings for other protozoa were—adults and children, *E. coli* 36·2 and 29·8, *Endolimax nana* 37·6 and 19·3, *Iodamoeba butschlii* 14·0 and 5·3, *Dientamoeba fragilis* 0·7 and nil, *Giardia intestinalis* 10·3 and 8·8, *Trichomonas hominis* 3·3 and nil, *Chilomastix mesnili* 6·8 and 1·8, no protozoa 23·1 and 35·1.

The findings for helminths were—adults and children, *Trichuris trichiura* 91·1 and 100·0, *A. lumbricoides* 15·9 and 63·2, *Strongyloides stercoralis* 4·7 and 3·6, hookworm (Necator) 27·1 and 84·2, *Clonorchis sinensis*, 1·2 and nil, no helminths 4·9 and 0 per cent.

Cestodes are very rarely encountered. *Schistosoma haematobium* is common in Mauritius. Clonorchis was found only in Chinese.

A. G. B.

PORTER (Annie). **Remarks on Intestinal Parasites in Montreal, and the Relation of *Entamoeba histolytica* to Colitis.**—Reprinted from *Canadian Med. Assoc. Jl.* 1934. Vol. 30. pp. 134–136.

The opinion current in Montreal that parasitic infection of man does not occur there is unjustified, for Dr. Porter has found 13 species of animal parasites in 139 hospital patients.

Some were from patients suffering from intestinal malaise, others served as controls. Both direct microscopical examination and a concentration method were employed ; in intestinal cases from 2–12 stools were examined, in the others one. The organisms found were as follows :—

" Rhizopoda.—*Entamoeba histolytica*, 18 ; *E. coli*, 7 ; *Endolimax nana*, 6 ; *Iodamoeba butschlii*, 3 ; *Dientamoeba fragilis*, 4.

" Flagellata.—*Trichomonas hominis*, 3 ; *Giardia intestinalis*, 7 ; *Chilonastix mesnili*, 19.

" Cestoda.—*Taenia saginata*, 1 ; *Diphyllobothrium latum*, 2 ; *Hymenolepis nana*, 1.

" Nematoda.—*Trichuris trichiura*, 2 ; *Ascaris lumbricoides*, 1."

There were 9 double, 5 triple and 1 quadruple infection.

The incidence of *E. histolytica* is relatively high ; 29 cases have come under the author's notice at Montreal. The occurrence of 5 species of amoebae as well as of others derived from food shows the care required

in differential diagnosis. The investigation, writes the author, demonstrates the need for proper sewage disposal, for the suppression of cyst- and ova-carrying flies, and prevention of contamination of food and water by human excrement. The cestode infections indicate the need for scrutiny of meat and fish and for thorough cooking.

A. G. B.

GILKES (Humphrey A.). **Two Little-Known Diseases of Northern Rhodesia : Onyalai and Chiufa.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Mar. 12. Vol. 27. No. 5. pp. 491–498.

Both these diseases, one unrecorded, are comparatively common in Northern Rhodesia.

Onyalai.—This disease was described by MASSEY (1904) and WELIMANN (1904) from Portuguese West Africa and from the Belgian Congo (Lualaba river) and by FELDMANN (1905) at Bukoba, now in Tanganyika Territory. In Northern Rhodesia it is found along the railway and in the villages of the Luangwa and Zambesi valleys : it is known as *chilopa* (bleeding disease). 53 cases were treated in the native hospital at Broken Hill between 1920 and 1933, 48 of whom were young adult males, 4 females and one a child ; 13 of these died. It is believed to be non-infectious, and there are indications that it is familial ; one or two isolated cases may be met with in a village, and it is known to relapse.

Symptoms.—Intense pallor ; skin usually covered with haemorrhagic areas, subconjunctival haemorrhages. "The inside of the cheeks, lips, and nose, and the palate show thickly distributed umbilicated vesicles about one-third of an inch in diameter. They are usually oval or circular and about the size of a pea. They are trabeculated and contain partly fluid and partly coagulated blood. Haemorrhagic spots occur on the mucous membrane of the larynx, trachea, and vocal cords." Haemorrhages are seen on the pericardium, endocardium and in the heart muscle, in some cases on the lungs, on the peritoneum and kidneys. The oesophagus and stomach contain blood but no ulcers have been seen. The kidney pelves and bladder contain blood ; retroperitoneal haemorrhages may be found. No effusion into joints : no enlargement of liver or spleen : no sponginess or swelling of the gums. The chief symptom is the bleeding which begins at the nose and mouth, the clinical picture is that of a man bleeding to death.

Microscopically, the blood gives the appearance of secondary anaemia. The cause is unknown : the suggestion is that it is a deficiency disease of the scurvy type. The author describes treatment but notes that the severe forms are as a rule rapidly fatal.

[Dr. SCOTT gave notes of this disease in his "Medical Research in the Colonies, etc." for 1929 : his information came from Dr. A. R. WALLACE of Northern Rhodesia.]

Chiufa.—This is an acute inflammation of the rectum and is described by the author from two cases under his care and from a description by a Jesuit Father who himself suffered from it in 1931 and had seen many native cases. Other names are *chinkumbi* and *kanyemba*. It is found in the Luangwa and Lusenfwa valleys at an altitude of 2,000–2,500 feet. The natives date it back to the epidemic of rinderpest in 1895. Its onset is sudden and it runs an acute course ; both the native sufferers seen succumbed after three days.

"The primary manifestation is stated to be a white powdery condition which appears round the anus and gives the appearance of boracic powder

or flour. In women this is stated to cover the vulva also. After a few days this disappears and the patient becomes acutely ill. He complains of pains in the back and neck. His temperature rises to 104°F. or higher, he is troubled with excessive sweats which bring the temperature down temporarily, and he becomes very weak. At this time an examination of the anus will show that the skin round it is reddened and hard. The sphincters become relaxed and the anus starts to open out. Soon the anus becomes a gaping orifice over 1 inch in diameter and the interior of the rectum can be seen through it, dilated and red with inflammation. The patient complains of a feeling described as " throbbing " in the rectum, but there is no real pain except in the spine from the cervical to the lumbar regions. Constipation is usual and absolute at this stage. The inflammation retreats further up the rectum as the disease progresses until the colon is involved, and at this stage there may be diarrhoea and vomiting. In women the inflammation is stated to involve the vagina also. The stools are said to be watery and full of mucus. The breath becomes very foul and the patient refuses food and drink. He appears unable to hear or reply when addressed, loses flesh rapidly, and passes urine involuntarily. Through the wide open anus the inflammatory process can be seen extending far up the bowel."

It is thought that the inflammatory condition reaches the splenic flexure.

The likeness of this condition to epidemic gangrenous rectitis of South America is noted, but gangrene is not a symptom in Rhodesia. Rectal schistosomiasis must be suspected. The native treatment to which the Jesuit Father submitted is detailed. Products of seven species of tree are used ; most of these contain tannin. The natives consider that Chiufa is water-carried. *A. G. B.*

WELCH (T. B.). **Onyalai.** [Correspondence.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. June 30. Vol. 28. No. 1. pp. 103–104.

With reference to GILKES' paper (above) Welch draws attention to a paper published in 1920 [see this *Bulletin*, Vol. 17, p. 241] on a case of onyalai from Kenya : the symptoms were restricted apparently to the skin and bladder and recovery ensued. Onyalai would appear to be widespread though not common in Tropical Africa. *A. G. B.*

MENON (T. Bhaskara). **Splenic Enlargement in South India. A Study based on Post-Mortem Records.**—*Indian Jl. Med. Res.* 1934. Apr. Vol. 21. No. 4. pp. 695–721. [31 refs.]

The author, who is Pathologist to the Government Royapuram Hospital, Madras, says that there are no figures of the causes of splenic enlargement of S. India. He has therefore studied the post-mortem records of his own hospital and of the Government General Hospital, Madras, over a period of 40 years, paying tribute to the work of the early pathologists. He regards as enlargement anything exceeding 7 oz., which corresponds to the 200 gm. of DE as the minimum for enlargement in Bengal [this *Bulletin*, Vol. 30, p. 43].

His summary and conclusions are as follows:—

" 1. A study of the post-mortem records of 5,054 consecutive autopsies for the last 40 years in the hospitals in Madras shows an incidence of splenic enlargement in 1,101 cases, a percentage of 21·9. This compares favourably with 54 per cent. in De's figures for Calcutta and 40 per cent. in Gharpure's figures for Bombay.

" 2. Of these cases, the splenic enlargement was slight (below 500 g.) in 66·3 per cent., moderate (between 500 and 1,000 g.) in 24·2 per cent., marked (between 1,000 and 1,500 g.) in 5·4 per cent., and extreme (above 1,500 g.) in 2 per cent., while the weight was not recorded in 2·1 per cent.

" 3. These enlargements are classified into various pathological types. Septic enlargement occurring in acute infectious fevers was responsible for the greatest number of cases, viz., 399 or 36·2 per cent. ; chronic venous congestion for 65 cases or 5·9 per cent. ; cirrhosis of the liver including Banti's disease for 103 cases or 9·4 per cent. ; tuberculosis for 84 cases or 7·6 per cent. ; syphilis for 20 cases or 1·8 per cent. ; malaria for 124 cases or 11·3 per cent. ; while kala-azar caused enlargement in 155 cases or 14·1 per cent.

" 4. Some uncommon types of splenic enlargement are recorded including one with localized deposit of lipoid material.

" 5. No new type of tropical splenomegaly was met with. The difficulty in classifying is mostly due to imperfect investigation.

" 6. It is suggested that in some types the splenic enlargement is due to the co-existence of more than one factor each of which by itself may cause enlargement."

The chief causes of the 399 septic spleens were " miscellaneous infective conditions " 90, lobar pneumonia 71, bronchopneumonia 44, septicaemia and pyaemia 48, acute peritonitis 23, abscess of liver 23 (20 amoebic), amoebic dysentery 18, enteric fever 15, pleurisy and empyema 12, bacillary dysentery 9. He suggests that the small figure for enteric is due to the difficulty in obtaining autopsies in that infection. Most of the chronic venous congestion cases were due to cardiac failure.

Of the cirrhosis cases 92 were associated with portal cirrhosis of the liver ; 5 are listed as cirrhosis with malaria and 5 as cirrhosis with kala azar and these are discussed with reference to the views of HUGHES [*ante*, p. 341], and of SHANKS and DE. (Whereas most authorities think that there is no evidence for malarial cirrhosis HUGHES disagrees; SHANKS and DE consider that fibrosis of the spleen and cirrhosis of the liver are not regular features of kala azar.) The author obtained evidence of fibrosis in two-thirds of 155 cases of kala azar (all dating from 1903).

The chronic hyperplasias (venous congestion) occur most often in the infective granulomata and in protozoal diseases.

Eight tables illustrate the various types of splenic enlargement.

A. G. B.

REVIEWS AND NOTICES.

JEANSELME (Ed.) [Professeur Honoraire à la Faculté de Médecine et à l'Institut de Médecine Coloniale de Paris, Médecin Honoraire de l' Hôpital Saint-Louis, Membre de l'Académie de Médecine]. **La lèpre**. [Leprosy.]—679 pp. With 259 text figs., & 14 coloured plates. 1934. G. Doin & Cie, 8 Place de l'Odéon, Paris (VIe). [600 Fr.]

This fine volume is weighty in more than one sense of the term, as it scales almost 9½ lbs. It is certainly the most authoritative and complete account of leprosy that has ever appeared in any language and must have taken the distinguished author, who was president of the third International Conference on Leprosy in 1923, years of work, including tours in many countries studying his favourite subject. The numerous figures of cases and of leprosy institutions, together with the beautiful coloured plates illustrating both the naked eye and microscopical appearances, constitute it a veritable descriptive atlas of the disease.

An historical introduction gives a most interesting account of the early history with full references at the foot of each page. The author concludes that none of the suggested references to the occurrence of leprosy in ancient times in Egypt, India, the Bible and in China can be accepted as established. He goes on to trace the generally recognised spread to Greece from Asia Minor in the fourth century B.C. and over Europe and the Western Hemisphere and in recent times, its carriage by the Chinese emigrants to Oceania. The geographical section is equally full and up to date and illustrated by a number of maps and he quotes BURNET'S estimate of five million lepers in the world.

A section on the bacillus of leprosy follows in which all that is best in the work of the early bacteriologists from HANSEN onwards is recorded, together with the most recent information on the subject, including the question of an invisible virus stage of the bacillus, and the conclusion is arrived at that so far only some multiplication of the organism in transplanted living tissues has been obtained outside the human body, but no true subcultures apart from living cells. Further, only localized self-healing lesions have been obtained in monkeys, etc., but no generalization of the disease as in human leprosy. Rat leprosy is included in this full and critical survey; equally valuable sections on serology, immunity and allergy and general anatomy and physiology follow, and in a section on etiology the probable methods of infection and the escape of the lepra bacilli from the body are fully discussed. Great caution is rightly shown in coming to any dogmatic conclusions on points which are still open to debate, but all the important evidence is carefully marshalled and the gaps in our knowledge still remaining are brought out.

The longest section of the work follows on the anatomical-clinical study of the disease. In this the author first describes the naked eye appearances in order from the earliest to the most advanced stages, and he deals with the microscopical appearances of each stage with the clinical ones in a manner admirably adapted to conveying the clearest description of the processes concerned. This section contains very numerous illustrations, mostly from the author's own collection; including the beautiful plates, most of which contain a number of

drawings, especially of the microscopical lesions, which could not be bettered, the whole constituting the best description of the disease as a whole with which the reviewer is acquainted. This part of the work is completed by sections on the evolution and stages of the disease and its prognosis and diagnosis, and he agrees with the recent Philippine Conference's proposal to speak of "arrest," but not "cure" of the disease, as it is just as impossible to say whether the last bacillus has been destroyed in leprosy as in tubercle.

The way is thus paved for the consideration of the very controversial subject of prophylaxis, in dealing with which the author once more effects a happy combination of the best of both the older and the more modern methods, and he speaks with great authority on account of his having paid personal visits to many of the great leper institutions of the world. In the first section he concluded that the middle ages crude compulsory methods were probably one factor in bringing about the reduction of the disease in Europe, and he supports the general conclusion that the humane Norway system greatly reduced leprosy in the latter half of the last century in that country. He points out, however, the advantages of leper colonies apparently first organized by General Galliéni in Madagascar, and of dispensaries in attracting voluntary admissions for the sake of treatment, and emphasizes the fact that at the present time only Japan and two South American Republics enforce rigid isolation of all lepers. The importance of separating the children of lepers from their infected parents as soon as possible after birth is stressed, and sterilization of lepers to limit the number of their children is discussed.

The last section on treatment commences with hygienic measures, including diet and exercise, and also deals with the evidence concerning the very limited value of the older metallic and other drugs, as well as local and physical methods to relieve deformities. About one half of the space is allotted to a full account of the preparations of chaulmoogra and hydnocarpus oils and the results of the modern treatment by injections of soluble active portions of the oils, in which both the advances that have accrued from their use and their limitations, especially in advanced cases in elderly patients, are brought out.

Only one minor printer's error, in spelling Mouart "Monat," has been noted. It is impossible to praise this book too highly and the reviewer would express the hope that the issue of a cheaper edition may increase its usefulness. *Leonard Rogers.*

GATER (B. A. R.) [King Edward VII College of Medicine, Singapore]. **Aids to the Identification of Anopheline Larvae in Malaya.**—160 pp. With 187 figs. 1934. Singapore: Published by the Government of the Straits Settlements and the Malaria Advisory Board, Federated Malay States. [$1.]

As is explained in the Introduction, this useful handbook has been produced in response to an urgent request from the above-mentioned Board for reliable keys and descriptions, which should include the entire Malayan anopheline fauna at present known. Since additions to the latter may eventually be discovered, all species hitherto recognized in the Malayan sub-region and Siam have also been tabulated. Thirty-four species of anopheline mosquitoes, besides several subspecies and varieties, have been recorded as occurring in Malaya so that unless a key is based on a study of all the species in the area in which it is to be

used, mistakes in identification are bound to occur. Nevertheless, anything like finality is for the moment impossible. A complete survey of the mosquitoes of Malaya has yet to be undertaken, and in some cases descriptions have had to be based on insufficient material, while on the other hand the larva of the Bornean *Anopheles errabundus*, and that of a species recently found by WILLIAMSON at Cameron's Highlands, and allied to *A. jamesi* but probably new, are as yet unknown. In the circumstances, the author emphasizes the preliminary nature of the present publication, and requests the co-operation of others with a view to the production of a revised edition. Meantime, supplementary information is to be published at intervals in the *Malayan Medical Journal.*

In addition to a "Table for Rapid Identification" and "Brief Descriptions of Species," the work before us comprises a general account of the anatomy and habits of anopheline larvae, "together with notes on classification and nomenclature, collecting, rearing, preserving, mounting and other cognate subjects," including instructions for the making of surveys. As regards the latter it is urged that, since the larval population may be subject to much seasonal variation, surveys in important areas should if possible be made for a year, at regular monthly intervals and, in order to afford a correct picture, should be accompanied by records of adults.

Non-specialists, and students of limited experience, are liable to err when using even the best constructed key, and the author rightly insists that, when a specimen "has been identified by the use of the Table, it should always be gone over in detail with the Brief Description." Following the "Table for Rapid Identification," which occupies twelve pages and is constructed on the readily intelligible dichotomic system, ninety-one pages are devoted to "Brief Descriptions of Species" (larvae only). At the end of each description, which is accompanied by clearly drawn figures of diagnostic characters, notes are given on habitat and on the relation of the species to malaria; and it is to be observed that, in the case of twenty species or subspecies, there is either "no evidence" or "it is considered unlikely" that the insect plays any part in transmission.

Two Appendices (the first dealing with "Equipment," and giving names and addresses of manufacturers, with prices; the second consisting of lists of "Species Recorded from Neighbouring Countries" and islands) conclude a practical and well-arranged guide, the utility of which will certainly not be confined to Malaya. *E. E. Austen.*

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